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From perception of contraries
to humorous incongruities

Carla Canestrari and Ivana Bianchi

According to the cognitive approach to humour, the understanding of jokes implies the recognition of an incongruity followed by its resolution. Through our work, we aim to contribute to this strand of research by investigating the link between cognitive processes and the understanding of humour. In particular, we will explore the distinction between the three different types of contrariety (global, intermediate and additive) that has emerged from the research on the psychology of perception and is characterised by different perceptual evidence, and how it applies to the concept of incongruity. We will also discuss what a reading of humorous incongruity in terms of perceptual patterns may add to previous definitions of incongruity and how it helps to contribute to the further operationalisation thereof.

1.   Incongruity: A multifaceted concept

As is well known, humour studies can generally be divided into three main perspectives: relief (psychoanalytical) theories, superiority (sociological) theories and incongruity theories. The latter perspective includes various approaches that, nevertheless, share the view that *incongruity* is central to the structure and processing of humorous stimuli (for an overview, see Forabosco 1992, 2008; Martin 2007; Dynel 2009). As some modern scholars have explicitly acknowledged, the idea that "incongruity" plays a role in the phenomena of humour is not new: it traces back to the time of Plato and Aristotle (Attardo 1994: 18–32, Shelly 2003, Perks 2012). However, it is in the last 40 years that this concept has taken on an increasingly significant role in the literature on humour, and paradoxically also in studies that explicitly contrast the idea of incongruity as crucial for explaining humorous phenomena at large, such as Cundall (2007), Eichinger Ferro-Luzzi (1997), Latta (1999), and Veale (2004).

Koestler's bisociation theory (1964), Suls's two-stage model (1972), Norrick's frame bisociation (1986) and Attardo's conceptualisation of script opposition (1997, 2001) are some of the most important examples of approaches to cognitive and/or linguistic aspects of humour that have applied and operationalised the idea of "incongruity" in one way or another. The writings on the subject contain several overviews (e.g. Keith-Spiegel 1972; Attardo 1994; Ritchie 1999, 2004; Martin 2007; Forabosco 2008; Dynel 2009, see also Dynel in this volume) of the concept of incongruity in humour studies.

Following Koestler's (1964) early formalisation, incongruity has been defined in several ways and according to different approaches, some of which are more rooted in linguistics, others in psychology and others still in between the two fields. As a result of this, the technical definitions of incongruity that have been put forward thus far differ slightly or sometimes quite significantly from one another. To cite just a few examples from a psychological perspective: McGhee (1979) considers incongruity to be a divergence from expectations, it has been studied in perceptual situations by Nerhardt (1970, 1976) and Deckers (1993), and it has been analysed in the context of verbal humour understanding by Suls (1972) and Shultz (1976). According to Attardo's cognitive linguistic analysis (1997) the definition of incongruity is strictly bound to the linguistic concept of "script opposition" (SO) as defined in the Semantic Script Theory of Humor (Raskin 1985) and in the General Theory of Verbal Humor (Attardo and Raskin 1991): "SO and incongruity are different conceptualisations of the same phenomenon" (Attardo 1997: 401). Moreover, the concept of "incongruity" has been modelled in terms of graded salience by Giora (1988, 1991, 2003), and in terms of an opposition between a marked and an unmarked message by Attardo (1997). These definitions are well known and frequently referred to in the literature. Less known, or at least less referred to, are other attempts to deal with incongruity based on – or at least inspired by – how other cognitive mechanisms (perceptual in particular) work. These attempts are interesting and in a sense they were the forerunners of the idea put forward in this chapter (i.e. the suggestion of a further possible way to operationalise incongruity based on studies of perception in psychology). We shall thus briefly revisit them in the next section before presenting and discussing our proposal.

1.1   Earlier definitions of incongruity inspired by perceptual phenomena

In 1932, Maier wrote a paper entitled "A gestalt theory of humour", in which he put forward the idea that the basic perceptual law, "the parts of a configuration depend on the whole they belong to" (i.e. one of the basic principles of perceptual organisation discovered by gestalt psychologists), was at the same time a basic principle for explaining humorous experience at large. According to this principle, the presence

of an element in humorous texts or situations perceived as incongruous in the context of the whole it belongs to stimulates reconfiguration of the elements into a new whole, leading to the humorous interpretation of the text (Maier 1932: 70).

The idea of incongruity was reformulated by Metz-Göckel (1989, 2008) in terms of something "breaking" the perception of a whole. A text cannot be perceived as something complete and harmonic with a clear structure (i.e. as a whole) until the incongruous part has been restored. The perceptual law of closure helps the perceiver repair the interrupted whole, while the perceptual law of *Prägnanz* (our tendecy to order our experience in a manner that is regular, orderly, symmetric, and simple) supports him/her in transforming it into a harmonic whole.

A set of basic laws of visual organisation, the laws of similarity, proximity, continuation, closure, and common fate, as well as the law of figure-ground organisation and that of isomorphism, was advocated by Smith (1996) to explain how perception functions in grouping the visual elements of a cartoon. He emphasised that incongruity is perceived and its resolution achieved, depending on how the parts of a humorous visual stimulus are organised.

Humorous ambiguities were defined with explicit reference to visual ambiguity by various authors. Russell (1996: 42), for example, defined ambiguity as the peculiar property of a situation perceived as a unit with two alternative interpretations, as in Rubin's classic vase-profiles image. Thanks to figure-ground reversal, what at first glance appears to be the figure in a bistable configuration suddenly becomes the ground and vice-versa, alternatingly. Veale (2008: 76) also defined the shift from an initial interpretation of a text to a second interpretation in terms of figure-ground reversal. Similarly, Hempelmann and Attardo (2011: 126, 146) made an explicit reference to Rubin's vase-profiles and to the phenomenon of figure-ground reversal when defending the idea of a logical mechanism involved in the resolution of humorous incongruities. The same concept was included in Viana's (2010) definition of a background script, which is processed first, and a foreground script, developed afterwards; the reference to perception is explicit: "the second script takes prominence over the first, both in terms of perception and meaning" (Viana 2010: 507).

Another example of an analysis of humour processing that points out the close relationship between humour and perceptual processing can be found in the weight-judging paradigm (Nerhardt 1970, 1976; Deckers 1993), which was explicitly connected by Forabosco (1992) to the creation of a perceptual organisation (a Gestalt). Nerhardt's (1970) pioneering study experimentally demonstrated that the perception of an incongruity is enough to elicit laughter. He asked participants to lift a series of weights. The participants did not know that only the last weight was much heavier (or much lighter) than the previous ones, and they laughed when lifting it. Nerhardt (1970, 1976) argued that this happened because a great

discrepancy occurred between the participants' cognitive expectations (built on the basis of the previously perceived weights) and what they actually perceived when lifting the last weight. As Forabosco (1992: 56) stated, lifting the series of weights gave rise to the perception of a gestaltic sequence, which was disregarded by the incongruous weight which came last.

These observations are thought-provoking and it is interesting to note that some of them have been put forward very recently (Veale 2008; Viana 2010; Hempelmann and Attardo 2011). Is this a sign that the investigation of the relationship between perceptual and humour processing is still promising and deserves more attention than it has received so far? Moving on within this mindset, we asked ourselves whether a fresh contribution might be derived from studying the relationship between the recognition of two objects or properties as contraries in the perceptual world and noticing an incongruity in a humorous text. Do the two processes have anything in common? This line of thinking led us to the distinction between three different types of incongruity – analytical, global and intermediate (Canestrari and Bianchi 2009) – which, as an initial experimental investigation demonstrated (Canestrari and Bianchi 2012), seem to affect the ease of recognising the critical incongruity in a humorous text. In this chapter we develop on these earlier proposals, adding new tenets.

2. From the perception of contrarieties to the recognition of humorous incongruities

2.1 Where do the ideas of additive, global and intermediate incongruity come from?

The distinction between the three different types of incongruity was inspired by the results of recent studies on the perceptual rules underlying the recognition of two visual, auditory, or motor properties, object and events as contrary to each other (Savardi and Bianchi 2000; Bianchi and Savardi 2008a, 2008b; Savardi 2009; Bianchi et al. 2011a, 2011b). The regularities that emerged from these studies have been referred to in terms of "principles of perceptual contrariety", whereby the term "principle" has the same meaning ascribed by the gestalt psychologists when talking of "principles of perceptual organisation", i.e. basic invariant rules. It is worth observing that we are not concerned with the traditional definitions of opposition produced by linguists and psycholinguists since the 1970s based on a linguistic analysis of antonyms (e.g. Clark and Clark 1977; Cruse and Togia 1995; Kennedy 2001; Jones 2002; Paradis and Willners 2011), but rather with a

new approach describing how things work perceptually. For example, from these studies on the perception of contraries (for an overview, see Bianchi and Savardi 2008a) we observed that contrariety can be experienced in three distinct ways.

1. *Global contrariety* defines the relationship that emerges when two objects/movements/properties are immediately recognised by an observer as being contraries to each other. Now, a first necessary condition for two events under observation to be perceived as contrary is evident opposition, but the second necessary condition is evident invariance. Indeed, in order to be perceived as contrary, two properties must be perceived as opposite instances of the same aspect (e.g. small-large are opposite instances of the size aspect). Similarly, in order to be perceived as contrary, two objects must differ substantially but only with regard to one or two characteristics. This last result was found in both production tasks (i.e. while asking participants to act out the opposite of a figure or a gesture) and recognition tasks (i.e. while asking them to choose the pair showing the most evident contrariety from a series of alternatives, or to rate these pairs in terms of their degree of contrariety or to classify them as similar, different or contrary). For example, comparing simple geometric figures, participants classified the pairs showing multiple variations (three or more contrary properties) as "different" rather than "contrary". Also, the transformation of a single property may be associated with too little invariance. For instance, the single transformation of the outline of a triangle from angular to curved in directionally oriented figures was judged to be too serious a violation of the identity of the initial figure: the new figure looked too dissimilar (i.e. not sufficiently invariant) to the initial one and was not perceived as its contrary. Conversely, changing the spatial orientation of a figure, for instance by transforming a figure pointing up into one pointing down, turned out to satisfy both the requirement of maximum contrast and clear invariance. The new figures were duly rated and classified as contrary to the initial figure.

2. *Additive contrariety* is the type of contrariety recognised between two perceptual stimuli only after an analytical comparison process of the features of the two objects/events is activated. This analytical comparison reveals that, in effect, the two stimuli differ in terms of many properties recognised as *contrary* in one stimulus in comparison to the other. Take an object, list its properties, then systematically transform them into the opposite properties and determine the new object that you have obtained: its features are all analytically contrary to those of the initial object. Perceptually, however, the overall result of this sum of 'local contrarieties' is not a self-evident contrariety, but rather the two stimuli are perceived as being different.

3. *Intermediate contrariety* is present when the condition of invariance between two stimuli is kept and the variation between two objects/events only affects one critical property (this satisfies the requirements of invariance described above), but the change is not strong enough to be perceived as an evident contrariety. This happens, for instance, when we change something small into something medium sized: the transformation is certainly directed towards the opposite state (bigness) but it does not reach a state or gradation that appears phenomenally opposite. The invariance characterising the two events is too high, and the contrast between them is not strong enough to make the two events appear opposite to each other: they are usually perceived as similar. Of course, for intermediate contrariety to be perceived, the property in question has to allow various phenomenal gradations, i.e. to identify a range of qualitatively different states and not be a point property (Bianchi et al. 2011a, 2011b).

How can all this contribute to the analyses of incongruity in humour understanding? Does this distinction help to capture something new? To answer this question, let us focus on jokes, which are short, context-free texts and humorous stimuli *par excellence*.

2.2   Global contrariety and perceptually based jokes

Consider the following joke, for example:

> Yesterday at school we celebrated my classmate Marcellina's birthday, so I gave her a cherry and she kissed me to say thank you. Today I gave her a watermelon … but she didn't get it![1]

Understanding this joke implies attributing two opposite interpretations to the text – also called "scripts" in Raskin's (1985) theory and its evolution (Attardo and Raskin 1991): a non-sexual and a sexual one. The joke does not overtly contain the term 'sex', but the allusion to this second interpretation (the discovery of which makes the text enjoyable and is left up to the reader) is built on two key elements, a cherry and a watermelon, that are opposite in terms of size, where the cherry is small, whereas the watermelon is big. The joke plays on this element. If a *small* gift (a cherry) stimulates a kiss, a *big* gift (a watermelon) should stimulate much more. One may also observe that a cherry and a watermelon have other opposite characteristics: for example, a cherry is light while a watermelon is heavy;

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1.   The recognition of incongruity in jokes was tested on Italian speakers with jokes in Italian. However, in the English version (which was not tested with English-speaking subjects) – the presence of "cherry" may overtly trigger a "sexual interpretation" for this joke, thereby bringing forth the phenomenon of an "additive contrariety".

a cherry contains one round stone, whereas a watermelon contains several flat seeds; a watermelon is red inside, whereas a cherry is red both inside and outside. However, what makes the size the critical feature of this joke is the fact that it is the only quality needed to work out its incongruity and therefore to grasp the humorous interpretation and the cherry-watermelon pair makes it stand out.

In other words, the point here is: size is the critical feature: what is the best '*big* gift' to be contrasted against the cherry in order to make the message clear? The answer suggested by the perceptual rules of contrariety would be that for the contrariety to be evident the new object needs to be invariant for almost all the other characteristics and maximally opposite only in relation to the critical feature. The watermelon meets all the requirements to be recognised as evidently opposite to the cherry (global contrariety): it is a fruit, like the cherry, it is round, like the cherry and it is red, like the cherry; but it is also big (indeed, it is the biggest fruit we are familiar with) in contrast with the cherry, which certainly belongs to the smallest family of fruits we are familiar with. As all the other features stay the same and the two fruits are good representatives of opposite sizes (small vs. big), the cherry-watermelon contrast is a case of global contrariety.

Moving from this specific example to the general perspective, when applied to jokes where the critical feature is perceptual, the three types of perceptual contrariety listed above would lead to the following predictions:

1. Global contrariety: when the critical feature of a joke concerns an aspect that is globally opposite in the two key elements (e.g. small-big), the recognition of their contrariety (and thus the recognition of the critical incongruity) might be facilitated. It can be predicted that jokes playing on this type of contrariety are recognised as mostly humorous since their critical incongruity stands out.

2. Additive contrariety: when the two key elements involve many contrary features, one can of course still recognise them analytically, but synthetically the two key elements are not perceived as being contrary to each other. We should remember that from a perceptual point of view, this cumulative aftermath leads to the recognition of diversity rather than opposition. Transferred to jokes, this would lead to the prediction of a weakened humorous effect. However, at the same time, one might wonder whether the analytical work activated by incongruities based on additive contrariety in order to discover the critical contrariety among the many others, might positively affects the humorous effect. The application of additive contrariety in the case of the above mentioned joke would require the watermelon to be replaced with a big polystyrene box, for example, which satisfies the requirement of opposition between something small and something big, but which at the same time also changes many other properties of the initial object into their opposites (the cherry is round, the box is square; one is edible, the other inedible; one is juicy, the other dry; one is a natural object, the other an artefact, etc…).

3. Intermediate contrariety: when an element conveys one of the two extremes of a continuum while another element represents the intermediate zone of the same range and they do not differ as far as any other feature is concerned, two elements are perceived as being more similar than different or contrary to one another. Applied to humour, this would lead to the expectation that a comparison of two key elements that are only relatively opposite (i.e. intermediate contraries) would not suffice to make the opposition evident and thus render the text *clearly* humorous. In the School joke example, one might, therefore, expect that replacing a cherry with an apple (which is certainly bigger than a cherry but not really a "big" fruit – it is perceived as having an intermediate size) will not generate a humorous interpretation as successfully as a global contrariety.

Initial testing of these hypotheses confirmed the fruitfulness of this distinction. Three studies were carried out among adult participants (Italian undergraduate students), using five jokes selected based on the criteria that they mentioned concrete entities – cherries, watermelons, apples, submarines, sardines, bats, policemen, etc. – and that the critical incongruity concerned sensorial aspects. Because of these two characteristics, they could easily trigger mental images associated with the scenes described, and the sensorial features of the entities compared might, therefore, be recognised not only at a semantic level but also in terms of the mental images activated by reading the text (for a detailed description of the studies, see Canestrari and Bianchi 2012).

We manipulated the incongruity involved in the five jokes according to the three types of contrariety described in the previous section (two examples are provided in Table 1).

In the first study, participants were shown the three versions of each joke and, in one condition, asked to rank them from the most to the least humorous. In another condition, a different group of participants was asked to complete each joke (where the part of the text that referred to one of the two key elements that make the text funny had been replaced by a blank space), by choosing one of the three alternatives that produced the funniest effect. With the exception of one joke (where the additive version tended to be preferred to the global version – this was, however, a tendency, not a significant effect), in all cases the global version turned out to be significantly more humorous than the intermediate and additive versions.

The second and third studies confirmed that the preference for the global version really indicated that participants noticed the critical incongruity in this condition more easily, as opposed to the additive versions (where it remained 'lost' among the many various contrary features characterising the two incongruous elements) or in the intermediate ones (where the evidence of contrariety was too weak). In fact, both when participants were asked to imagine the objects representing the key-elements of the five jokes in themselves, not in the context of the joke, and to list their opposing characteristics (study 2), and when they were asked

to chose the critical feature on which each joke played from a list of properties (derived from study 2), the results proved that the critical contraries were identified more easily and more frequently in the global version (around 80%) than in the intermediate (around 60%) or additive versions (around 50%).

In other words, these results suggest that when perceptually based jokes are taken into account, the recognition of incongruity is facilitated when it lies between elements which are globally contrary to one another, as compared to when they differ either too much (additive contrariety) or too little (intermediate contrariety).

Table 1. Examples of the three versions of the five jokes studied. The two key elements of each version are underlined and their contrary properties are listed in the last column (col. IV) with the critical contrariety in bold.

Jokes[2]	Versions	Type of contrariety	Contrary properties
School	Yesterday at school we celebrated my classmate Marcellina's birthday so I gave her a <u>cherry</u> and she kissed me to say thank you. Today I gave her a <u>watermelon</u>… but she didn't get it!	G	**small/big**
	Yesterday at school we celebrated my classmate Marcellina's birthday so I gave her a <u>cherry</u> and she kissed me to say thank you. Today I gave her a <u>big polystyrene box</u>… but she didn't get it!	A	**small/big** edible/inedible round/square natural/artificial
	Yesterday at school we celebrated my classmate Marcellina's birthday so I gave her a <u>cherry</u> and she kissed me to say thank you. Today I gave her an <u>apple</u>… but she didn't get it!	I	**small/medium sized**
Expert	"You were the biggest <u>sardine</u> expert, so why are you studying <u>whales</u>?" "I'm getting old, so my eyesight is bad now."	G	**small/big**
	"You were the biggest <u>sardine</u> expert, so why are you studying <u>submarines</u>?" "I'm getting old, so my eyesight is bad now."	A	**small/big** animate/ inanimate biological/ mechanical natural/artificial
	"You were the biggest <u>sardine</u> expert, so why are you studying <u>cod</u>?" "I'm getting old, so my eyesight is bad now."	I	**small/medium**

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2. The original jokes were in the global version and written in Italian, since the participants of the studies were Italian native speakers. The jokes were taken from various internet sites.

3.   In dialogue with the studies on humorous incongruity

The three kinds of humorous contrariety highlighted in the previous section are discussed here in the light of the main findings and theoretical achievements based on the literature on the incongruity-resolution model. Firstly, we will compare our concept of contrariety to the main meanings that the concept of incongruity has assumed within this model. Secondly, we will discuss the three kinds of humorous contrariety in terms of their structure in reference to a continuum ranging from pure incongruity to incongruity-resolution humour.

3.1   Incongruity and contrariety

Despite the general consensus on the centrality of incongruity in humorous phenomena (Martin 2007: 63), a general consensus on the meaning of the word has yet to be achieved (Ritchie 1999: 78). In its broad sense, it concerns "something unexpected, out of context, inappropriate, unreasonable, illogical, exaggerated and so forth" (McGhee 1979: 10); something that occurs "when the arrangement of the constituent elements of an event is incompatible with the normal or expected pattern" (McGhee 1979: 6–7).

   We already pointed out, at the very beginning of this paper, that the concept of incongruity is multifaceted since various technical definitions of it have been provided (although they share a common core idea). Here, we will discuss in detail the two of them that focus on humour processing of jokes, in order to see how the definition of an intermediate, global and additive contrariety relate to them.

   Several authors (e.g. Ritchie 1999, 2004: 59–68; Dynel 2009: 56, 2012) have provided a general categorisation of the meanings of the word 'incongruity' with reference to jokes. Given that a joke has a set-up (Sherzer 1985), also called a build up (Hockett 1977), which has the main function of introducing the characters and the setting and time in which the story takes place, and a punch line, generally defined as the closing element of a joke, the term "incongruity" is used in the literature with two meanings to focus on two aspects of joke structuring and processing.

   In the first sense, typical of the two-stage model by Suls (1972, 1983), the punch line produces a sudden and unexpected incongruity since this is the line that is not coherent with the whole text and with the expectations, or predictions, that the readers have based on the text (first phase). The reader/listener is thus pushed to find a cognitive rule capable of either resolving or removing it (second phase). This process is activated typically when a kind of joke structure is considered, that is red-light joke, which "draws merely on an incongruous punch-line, which provides unexpected and incongruous piece of information" (Dynel 2012: 25). It is also activated when the set-up contains a *covert ambiguity* (Dynel

2009, 2012), namely in *garden path* jokes (Yamaguchi 1988; Dynel 2009, 2012; see also Mayerhofer and Schacht in this volume). When the punch line is delivered, the explicit meaning of the set-up no longer appears valid (first phase) and the incoherence (or incongruity) between the set-up and the punch line pushes the reader/listener to re-read the whole text and to find the hidden meaning of the set-up (second phase). Therefore, the reader/listener reprocesses the set-up and finds its hidden interpretation. The understanding process of ambiguous set-up jokes falls under the "surprise disambiguation approach" (Ritchie 1999), also called "forced-reinterpretation model" (Ritchie 2004: 59; De Mey 2005).

When ambiguous set-up jokes in particular are taken into account, the word "incongruity" is also used to indicate the contrast between the explicit and the hidden interpretation of the ambiguous set-up, which result from the resolution phase. Therefore, also in this case the set-up contains a "covert incongruity" and the reader/listener is forced to backtrack and reinterpret the whole text in order to find the hidden interpretation of the set-up. Differently to the first sense, the incongruity is not sudden and does not come before the resolution is achieved, but lies in the *comparison* (Ritchie 1999) of the two meanings discovered by means of the resolution. In this sense, incongruity refers to the incompatibility of two *frames of reference* (Koestler 1964), or to the *script opposition* as conceptualised by Attardo (1997).

One might wonder whether the taxonomy of humour based on our three kinds of contrariety can be brought back to one of the two alternative perspectives. Our answer is negative. Unlike the two-stage model, which defines incongruity as a function of the distance between the punch line and the recipient's expectations built on the set up (Suls 1972: 96), the two contrary elements can be found both in the set up. The three types of contrariety cannot thus be reduced to a sudden and unexpected incongruity. In the School and Expert jokes (Table 1), for example, the two key elements are established in the set-up[3], and the contrariety of their relationship would have been there even if there had been no punch line. One may note that the humorous aspect of the text is derived from something more than the perception of a contrariety, namely from its resolution. This is of course true, but the presence of an evident global relationship of contrariety is essential for the two jokes to be humorous.

If we now move on to consider how our three types of contrariety relate to the incongruity considered as the contrast between a hidden and an explicit meaning, we should observe that contrariety is not the result of the comparison of

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3. The Expert joke, contrary to the School joke, involves a *crossroads mechanism* (Dynel 2012): the incongruous elements in the set-up produce an incomprehensibility, which can be resolved once the punch line is delivered and understood.

two interpretations of the same piece of text (namely the set-up, which precedes the punch line), which, after the resolution, can be read in terms of an explicit and a hidden meaning. For instance, in the School joke the contrast between the two incongruous meanings can be traced: it plays on a covert ambiguity, whose disclosure produces the incongruity between a childish and a sexual situation. According to Raskin's theory (1985:127), this reading of the joke is at the lowest level of abstraction, namely a basic level "essential to human life" (Raskin 1985:113). A more concrete level has been identified (Di Maio 2000, cited by Attardo 2001:20) to explain the humorous opposition of a joke. For instance, in the well-known Doctor joke[4], 'lover' and 'patient' are a more concrete script opposition than 'sex' and 'no sex' (Attardo 2001:20). However, in this case, the opposition is again discovered after the joke is understood, as the patient is revealed to be a lover once the punch line is delivered and grasped. What our three types of contrariety operationalise is a contrast defined at a much lower level of abstraction, since it is strictly linked to the concepts evoked by the words in the joke (e.g. cherry and watermelon, sardine and whale), with a small inferential distance (a cherry and a sardine stand for something small and a watermelon and a whale for something big) and the contrast is activated before the resolution occurs. The shift from a childish to a sexual situation, like the concrete script opposition described by Di Maio (2000), implies a wider inferential distance, which can only be covered once the joke is worked out.

From the perspective of the above mentioned approaches to concrete versus abstract levels of abstraction in the opposition of a joke, the three variations of the jokes used in the studies can be considered modifications of their *situations*[5] (Attardo and Raskin 1991; Attardo 2001), rather than variations of the "script opposition" they activate (Raskin 1985), which are manipulated instead in Ruch, Attardo and Raskin (1993), for example. Conversely, from our perspective, the three variations embody three types of contrariety.

To sum up, the three types of contrariety offer a further way to look into the concept of incongruity and to operationalise it, and they are not redundant in relation to previous definitions and classifications.

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4. "'Is the doctor at home?' the patient asked in his bronchial whisper. 'No,' the doctor's young and pretty wife whispered in reply. 'Come right in'" (Raskin 1985:100).

5. The situation is one of the 6 knowledge resources on which the General theory of Verbal Humor is built (Attardo and Raskin 1991; Attardo 2001). Here is a definition of situation: "Any joke must introduce some event or Situation such as changing a light bulb, crossing the road, playing golf, etc. The Situation of a joke can be thought of as the "props" of the joke: the objects, participants, instruments, activities, etc." (Ruch et al. 1993).

3.2   Various structures of humorous stimuli

In addition to incongruity-resolution humour, pure incongruity humour has also been investigated in the literature. The former has been supported by most of the scholars investigating the cognitive aspects involved in the comprehension of humorous verbal texts and cartoons, whether in a linguistic perspective (e.g. Raskin 1985; Norrick 1986; Lessard 1991; Attardo and Raskin 1991; Attardo 2001; Dynel 2009), in terms of cognitive linguistics (e.g. Giora 1991, 2003; Brône and Feyaerts 2004; Brône et al. 2006; Hempelmann and Samson 2007, 2008) or neuropsychology (e.g. Bartolo et al. 2006; Uekermann and Daum 2007) or in a psychological perspective (e.g. Maier 1932; Suls 1972; Godkewitsch 1974; Forabosco 1992; Ruch 1992; Hillson and Martin 1994; Smith 1996; Ruch 2001; Metz-Göckel 2008; Veale 2008; Canestrari and Bianchi 2009, 2012). The latter has been considered mainly from a cognitive point of view (e.g., Nerhardt 1970, 1976; Deckers 1993; Shultz and Pilon 1973; Shultz 1974, 1976; Shultz and Horibe 1974). A case of pure incongruity is the weight-judging paradigm: lifting a weight that is much heavier (or much lighter) than the others and, therefore, than expected is a funny incongruence on its own. Slapstick humour is also built on pure incongruity: it shows a deviation from a norm or an expectation with no need to resolve it (the classic case is slipping on a banana peel). From a developmental point of view, pure incongruity humour is more basic than incongruity-resolution, since pure incongruity humour is usually preferred by younger children rather than older children or adults (e.g. Shultz and Pilon 1973; Shultz 1974, 1976; Shultz and Horibe 1974). A possible cognitive reason for this is that children are not able to resolve the incongruity of a resolution humorous stimulus, which is more complex, until the age of 6–7, when Piaget's concrete operational stage is achieved. This corresponds to the fourth and final stage in humour development (McGhee 1979)[6]. When more complex types of humour start to be appreciated, it is likely that pure incongruity loses part of its power.

Pure incongruity was initially defined as "unresolvable incongruity", i.e. an incongruity that does not need to be solved in order to be understood and in order to appreciate its humorous effect (Shultz 1976). However, there has been a subsequent debate on the presence of a kind of resolution in pure incongruity humour (Forabosco 1992) as well. The resolution required in this kind of stimulus would be given by a "congruence criterion", described by Forabosco as a "cognitive mastery".

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6.   Conversely, other evidence shows that 4- and 5-year-old children are capable of resolving incongruities in humorous cartoons if they are suitable for their age (Pien and Rothbart 1976). For an overview of the cognitive development of humour comprehension and appreciation, see Chapman and Foot (1977:199–234) and Martin (2007:234–247).

> A congruence criterion can be defined as any element relating to the stimulus on the basis of which the stimulus, at least in that specific respect, is congruous. A very rudimentary example of this criterion might be the statement that 'it is just a drawing and not a real face' enabling a child to consider a distorted face as susceptible to cognitive mastery.   (Forabosco 1992: 58)

As some authors have pointed out (e.g. Rothbart and Pien 1977; Forabosco 1992), one characteristic of humorous incongruity is that some residual incongruity still remains after the resolution. This is not the case when the resolution of serious (not humorous) incongruities is at issue. For example, the rotation of the Earth is incongruent with humanity's perception of the Earth's stability, but it is solved by the astronomic explanation. In other words, the problem-solving activity required to work out a serious dilemma produces a resolution that renders the problematic elements of the situation completely coherent with it. This does not apply to humorous incongruity, which "will also be (and must be) accessible to the perception of the subject *at the end* of the process" (Forabosco 1992: 59). Indeed, the initial incongruity turns into a 'congruent incongruity' (Forabosco 1992: 59): the two incompatible meanings or situations evoked by a humorous stimulus are still available after the resolution process, so that they are perceived as both incongruent and congruent at the same time (Forabosco 1994: 17). To sum up, a delicate balance between incongruity and resolution should be preserved in order for humour to be perceived.

In addition to this basic residual incongruity, further incongruous elements can persist after the resolution. This is the case of impossible incongruity (Rothbart and Pien 1977: 37): for example, a situation in which bats talk to each other is clearly incongruous with the normal state of affairs and common world knowledge. It does not need to be resolved but rather accepted as presented (Maier 1932: 72). Another important case of persistent incongruity is that of nonsense, which is in fact defined as a kind of humour whereby the resolution is weak and the incongruity is predominant. In nonsense, an important residual incongruity persists after the resolution phase. The resolution phase can in fact create further incongruity, or there may even be no resolution at all (McGhee et al. 1990; Ruch 1992).

In summary, the structure of a humorous stimulus can vary in terms of the type of resolution involved in understanding it and in terms of the amount of incongruity present before and after the resolution phase has occurred. In the literature, the possible structures of a humorous stimulus have been organised along a continuum ranging from pure incongruity to incongruity-resolution structure (McGhee et al. 1990; Ruch 1992; Hempelmann and Ruch 2005; Forabosco 2008: 56; Samson and Hempelmann 2011). Pure incongruity is usually placed at one of the extremes of this continuum because it only plays on a deviation from the expectations and the reference to a resolution is only that of a congruence

criterion (Forabosco 1992). Nonsense humour is then placed between pure incongruity – and in some cases, where no resolution is involved, overlapping with it (McGhee et al. 1990; Ruch 1992) – and incongruity resolution humour, since important residual incongruity persists after the resolution phase, as in the case of impossible incongruity (Rothbart and Pien 1977:37). Incongruity resolution humour is at the other extreme of the continuum, since this structure contains the lowest level of incongruity, including the incongruity that persists after the resolution phase (Forabosco 1992).

The taxonomy of humour structure based on the three types of contrariety highlighted in the previous section may enrich this idea of a continuum. Taking it for granted that a residual incongruity always remains after the resolution of any humorous stimulus, and that a sort of resolution (at least that of the congruence criterion) is always present, the amount of resolved and unresolved incongruity can determine the position of a humorous stimulus along the continuum. If one considers the jokes used in our studies, such as those given in Table 1 (Canestrari and Bianchi 2009, 2012), one notices that they are all examples of incongruity-resolution humour. For example, the punch line of the School joke allows us to switch from an innocent and childish situation to a sexual meaning through hidden reasoning (the resolution): a small gift (a cherry) is to foreplay (a kiss) as a big gift (a watermelon) is to sexual intercourse. If the resolution is not achieved the joke cannot be either understood or appreciated. The first contribution that may result from our distinction between three types of contrariety concerns a possible definition of the sub-structures of incongruity resolution humour. In fact, it suggests that if pure incongruity (characterised by a weak resolution and plenty of incongruity) defines one extreme, the opposite extreme may be occupied by incongruity-resolution humour structured according to the intermediate contrariety. Intermediate based humour may deserve to be placed at the opposite extreme of the continuum since it preserves strong invariance and contains the lowest level of contrariety between the two key elements of the joke (e.g. cherry vs. apple, and sardine vs. cod in the School and Expert jokes, respectively). Incongruity-resolution humour based on the global contrariety structure (e.g., cherry vs. watermelon, and sardine vs. whale in the School and Expert jokes, respectively) may come immediately after it, in-between intermediate and additive incongruity-resolution humour, because it contains fewer contrary features than the additive structure (cherry vs. big polystyrene box and sardine vs. submarine in the School and Expert jokes, respectively) but more than the intermediate structure. This would be followed by the additive contrariety: this kind of humour is closer to nonsense than incongruity-resolution humour based on intermediate and global contrariety because it contains a larger quantity of contrary features. In fact, in additive contrariety, the principle of invariance between the two objects compared

is low and the incongruous, or rather contrary, elements are multiplied. Similarly to nonsense humour, after the resolution phase has occurred, the additive versions of the jokes left several incongruities unresolved. For example, it is not explained why the sardine expert shifts his attention from an animate, biological, natural organism to an inanimate, mechanical, artificial object. The only question that the resolution can answer is the meaning of the passage from something small to something big.

In other words, the distinction between intermediate, global and additive contrariety, when confronted with the classical continuum organising various types of humour stimuli, suggests that incongruity-resolution humour can take various forms that are hierarchically organised along the continuum, depending on the number of contrary features on which the two key elements of a joke play and the degree to which the principle of invariance is violated.

Another aspect emerging from our analysis that remains in line with previous literature concerns the difference between global and intermediate contrariety and, in particular, the outcome whereby global contrariety was deemed funnier than intermediate contrariety. A similar conclusion was reached for the weight-judging paradigm (for an assessment, see Deckers 1993). According to this last approach, incongruity is defined as the distance between a starting weight, called standard, and other weights, called comparisons. Among the comparisons there are critical weights, characterised as very incongruous in relation to the standard. The heavier the critical weight in comparison to the standard, the greater the fun and amusement (Deckers 1993). In other words, when the two compared objects are very distant to one another (light-heavy) within the same dimension (weight) – i.e. the condition prescribed by our 'global contrariety' – the two elements are perceived as more incongruous/contrary to each another than when their distance is smaller, as in the case of intermediate contrariety.

If an evident distance thus seems crucial for detecting incongruity in humorous texts, this is not the whole story. Some approaches have emphasised that this distance has to coexist with a sharp proximity. Although our theoretical starting point and our methods differ from those used in the domain-interaction approach to model incongruity and resolution in terms of semantic distance – within adjective-noun pairs (e.g. Godkewitsch 1974) or word pairs (Hillson and Martin 1994) – our results agree overall with the conclusions drawn in this field. In fact, what we term 'global contrariety' can be considered a synthesis between a large between-domain distance (namely an extreme distance in the same dimension, e.g. big/small for the 'size' dimension) and a small within-domain distance (namely the presence of invariant properties between the two compared elements). These are the conditions that, according to the domain-interaction approach, cause humour ratings to increase and this has also been shown by our participants' preference for global contrariety.

In our proposal, the importance of this proximity component is emphasised by the central role played by the principle of invariance, which is crucial for distinguishing the three types of contrariety. Intermediate, global, and additive contrariety are identified depending on the degree of invariance they sustain, and this is precisely what makes the difference between the perception of similarity, contrariety, or diversity between two stimuli in the perceptual domain (Bianchi and Savardi 2006, 2008a, 2008b). This idea recalls Beattie's observation (1776: 454):

> If then, it be asked, what is that quality in things, which makes them provoke that pleasing emotion or sentiment whereof laughter is the external sign? I answer, it is an uncommon mixture of relation and contrariety, exhibited, or supposed to be united, in the same assemblage.

Apter's (1982) concept of synergy in the reversal theory is similar in that the *simultaneous* perception of two contradictory viewpoints is indicated as a central cognitive aspect of humorous experience. This simultaneous perception of contrast and invariance is guaranteed in the global contrariety pattern: if two objects share most of their features (or if two properties belong to the same dimension) a strong invariance between them is perceived, but if the variation between the two shows two extreme poles of the same dimension, they are also perceived as being in evident contrast.

4.   Conclusion

The application of the three types of contrariety discovered in the field of the psychology of perception (additive, global and intermediate) to the analysis of humorous incongruity in perceptually based jokes helped shed light on further aspects (not yet explored by previous literature) concerning the cognitive factors underlying the detection of incongruity in humour processing.

From a theoretical point of view, we have suggested that intersecting the incongruity-resolution type of humour with the three types of contrariety leads to a more analytical taxonomy of various types of incongruity-resolution humour. Jokes, in fact, belong to this latter general category built on intermediate, global, and additive contrariety, which differ, however, as far as the quantity of incongruity involved is concerned and in terms of the residual incongruity remaining after the resolution phase has occurred, and this can be reflected by placing them at different positions along a continuum.

We have also stated that the application of the three types of contrariety to the analysis of perceptually based jokes has to do with the structure of jokes at the lowest level of abstraction, and in this sense it is not redundant in relation to other classifications of incongruity defined at higher levels of abstraction. In

analysing where these contrary elements appear in the text, we have pointed out that the critical contrary elements can be found in either the text (either in the set-up, or one in the set-up and the other in the punch line), or even one in the text and another in the reader's expectations. Whether these two conditions are associated with a different phenomenal evidence of contrariety, and whether this has a different impact on the understanding of incongruity in humorous texts, is an aspect deserving of further study.

The first experimental investigation (Canestrari and Bianchi 2012) briefly referred to in the text demonstrated (a) that in most cases, when the humorous incongruity of a short verbal text is built on a global contrariety, the humorous effect is better achieved than if an intermediate or an additive contrariety is involved; (b) that this result can be effectively explained by the fact that participants noticed the critical contrariety on which the incongruity played more immediately. In fact, both outside and within the joke context, the key elements of the funny stories on which the incongruity was set-up were better recognised when the two key elements showed a global contrariety rather the other two types of contrariety.

We are aware of the limits of the experimental investigation referred to, and acknowledge that we have only begun to develop the potential impact of this taxonomy into contemporary definitions of incongruity in humour theories. A first important limit of our study is that the jokes analysed shared a clear perceptual characterisation of the situations described in the humorous texts. This seemed to us to be the first natural field of application and test situation for the hypothesis of a possible shift of the rules discovered in perception from the original domain into the field of verbal humour, but this is, of course, only a starting point. The potential generalisation of these results beyond those limits is a thought provoking issue. For example, it seems to us that the three kinds of contrariety can be applied to verbal irony, in the perspective provided by the two-stage approach (Giora 1995; Giora and Fein 1999). According to this approach, understanding an ironic utterance is the result of the contemporary activation of two meanings, i.e. what is said and what is meant, and their comparison. This comparison has been said to produce a sort of contrast or difference between the two meanings (Giora 1995: 245). It might be interesting to test experimentally whether different outcomes (in terms of the effectiveness of irony) can be linked by contrasting the two meanings in terms of global, intermediate, or additive contrariety. It might also be interesting to study this not only when the recognition of an ironic utterance is involved (i.e. recognition tasks), but also by considering which of the three types is normally used when producing an ironic utterance in everyday life (i.e. production tasks).

Another area deserving further consideration is the exploration of the types of humour to which this taxonomy does not apply or for which it proves irrelevant: setting the boundaries of its application contributes to the clarification of the conditions under which it works and to the identification of both its potentialities and limits.

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