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Norm-Based Expectations Affect Children’s Understanding of Verbal Irony

Vera Hukker, Simone Sprenger, and Petra Hendriks

1. Introduction

If a friend returns a precious musical instrument with clear scratch marks on it, adults will immediately understand that the utterance “I can see you’ve been very careful with my guitar!” is not meant literally, and certainly not as a compliment. In contrast, children until age 5 or 6 will think that the speaker really believes the listener has been careful (e.g., Hancock et al., 2000; Pexman & Glenwright, 2007). To fully understand irony, children need to understand the speaker’s intention as well as the speaker’s attitude towards the situation (e.g., Filippova & Astington, 2008, 2010). Learning to understand irony takes multiple years and depends on children’s development of linguistic and cognitive skills (e.g., Matthews et al., 2018) and their experiences with social situations in which irony occurs (e.g., Pexman et al., 2019). Irony is often used in response to a violation of an expectation that is based on a particular norm (e.g., that people should treat others’ belongings with care). As norms are positive by default, this might explain why irony is used more often (Gibbs, 2000) and is better understood (e.g., Kreuz & Glucksberg, 1989) when used to criticize (in response to a violated positive expectation) than to compliment (in response to a violated negative expectation). However, the extent to which different types of expectations contribute to irony understanding is still unknown. The current study aims to investigate this in an experiment with 7- and 8-year-old Dutch-speaking children.

1.1. Irony and expectations

According to Wilson (2013), “the most common use of irony is to criticize or complain when a situation, event or performance does not live up to some norm-based expectation (...)” (p. 44). Such ironic criticisms (e.g., “You’ve been a great help!” when someone did not provide help) are used more often than ironic compliments (e.g., “You certainly failed!” when someone passed with honors), which is known as an *asymmetry of affect* (Clark & Gerrig, 1984). According to

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the echoic mention theory (Sperber & Wilson, 1981), this asymmetry exists because positive standards and rules of behavior are commonly known and frequently invoked, and thus are always available to echo ironically when being violated. In contrast, negative standards and rules are not generally available. Thus, criticizing a positive outcome via an ironic compliment requires prior fears or doubts (e.g., the fear to fail) to refer back to. Similarly, the pretense theory (Clark & Gerrig, 1984) argues that, because ironists cling tightly to norms of success, when these norms are violated, they should be more likely to make positive pretenses than negative pretenses. Whereas these theories and others, such as the mention theory (Jorgensen et al., 1984) and the allusional pretense theory (Kumon-Nakamura et al., 1995), describe different types of expectations (e.g., norms, hopes, rules, and preferences), it is unknown whether these different types of expectations influence irony understanding differently.

Broadly, a distinction can be made between expectations related to social behavior and expectations unrelated to social behavior. The former type of expectations, *norm-based expectations*, are based on social norms regulating social behavior, such as moral norms based on justice (e.g., being polite to other people), or conventional norms based on rules within particular social groups (e.g., taking our shoes off when entering a house) (see e.g., Nucci & Turiel, 1978). The latter type of expectations are based on hopes or preferences that suit a particular situation (e.g., nice weather when going out for a picnic). These *situation-based expectations* are individual expectations that can however be socially shared in specific situations: everyone prefers nice weather over bad weather when going out for a picnic. The distinction between norm-based expectations and situation-based expectations may be relevant for the development of irony understanding.

1.2. Development of irony understanding

Irony understanding develops gradually (e.g., Filippova & Astington, 2008), starting with the detection of a mismatch between an utterance's literal meaning and its context and understanding of the speaker's belief (what the speaker actually thinks), emerging around the age of 5 or 6 (e.g., Filippova & Astington, 2008; Hancock et al., 2000). Understanding of the speaker's intention (what the speaker wants the listener to believe) follows around the age of 7 or 8 (e.g., Filippova & Astington, 2008, 2010; Nilsen et al., 2011). For understanding of the speaker's attitude (what the speaker wants to convey beyond the message in words), findings of studies differ with respect to the moment of occurrence (e.g., Filippova & Astington, 2008, 2010; Hancock et al., 2000; Pexman & Glenwright, 2007), possibly because aspects of the speaker's attitude (e.g., meanness, funniness, and teasing) were examined differently. In this paper, we focus on the emotional part of the speaker's attitude (e.g., the speaker's anger), as emotion understanding has received little attention in the developmental literature while expressing emotions is one of the functions of irony (Roberts & Kreuz, 1994).

The ability to understand irony depends on Theory of Mind (ToM) skills. First-order ToM (ToM-1), which appears around the age of 4 (Wellman et al., 2001, for an overview), suffices to understand the speaker's belief. In contrast, second-order ToM (ToM-2), which appears between the ages of 6 and 8 (e.g., Perner & Wimmer, 1985), seems to be needed for speaker intention understanding (Filippova & Astington, 2008; Happé, 1993; Nilsen et al., 2011). Which level of ToM is required for speaker attitude understanding is still unknown.

In addition to ToM skills, children's irony understanding seems to be facilitated by social factors such as knowledge of norms, as children understand ironic criticisms – which are often based on norm-based expectations – better than ironic compliments (Hancock et al., 2000; Pexman & Glenwright, 2007; Whalen & Pexman, 2010). Children already know and enforce social norms from the age of 3 (e.g., Schmidt & Tomasello, 2012). However, not much is known about how expectations based on norms influence children's development of irony understanding, and whether their influence is different from that of other expectations. To our knowledge, only Massaro et al. (2014) compared different types of expectations. For 7-year-olds, but not 5-year-olds, they found superior irony understanding for violations of socially shared norms (e.g., not tidying up toys) as opposed to situationally defined norms (e.g., eating a cake that should have been eaten the next day), which they predicted because they expected socially shared norms to be more generalizable and to activate knowledge of interpersonal relations. Thus, it seems that expectations can play different roles in irony development. However, the types of expectations studied by Massaro et al. (2014) both concern social behavior. In our study, we compare norm-based expectations concerning social behavior with situation-based expectations that are unrelated to social behavior. We hypothesize that irony understanding will benefit from children's early acquired knowledge of norms.

1.3. The current study

In this study, we investigate how norm-based expectations and situation-based expectations influence children's acquisition of irony understanding. Different from Massaro et al. (2014), we consider different steps in understanding of irony (speaker belief, intention, and attitude) separately. Social norms will be operationalized as moral norms, as children judge moral norms as more important (Tisak & Turiel, 1988) and more serious when being violated (Smetana, 1981), compared to conventional norms. This strong moral awareness is expected to help children to understand ironic utterances when a moral norm gets violated.

An irony comprehension task is carried out with 7- and 8-year-old children, as these children have usually acquired speaker belief understanding but are still developing speaker intention understanding. We predict accurate speaker belief understanding regardless of type of expectation. We predict less accurate speaker intention understanding, with better understanding when norm-based expectations rather than situation-based expectations are violated. We also predict better speaker attitude understanding when norm-based expectations are violated, as

Filippova and Astington (2010) argued that early exposure to norms can help children to assess particular aspects of the speaker's attitude, such as how mean or funny the speaker is. We will examine whether this early exposure to norms also helps children to assess the emotional aspect of the speaker's attitude.

The irony task is followed by two control tasks. In an antonym task, children's ability to name the antonym of the evaluative expression that occurred in the irony task is investigated. In a social norms interview, children are asked about their knowledge of the social norms that are used in the irony task.

2. Method

2.1. Participants

Participants were 46 children from two primary schools in the north of the Netherlands. The data from four children had to be excluded because of an unfinished test session ($n=2$), prior knowledge of the goal of the task ($n=1$), or technical problems ($n=1$), leaving 42 children (24 girls) aged 6;11-9;4 ($M=8;1$) in the sample ($n=3$ below 7;0 or above 8;11). Twenty university students (10 female) aged 20;8-29;3 ($M=22;8$) participated as a control group. Participants were native speakers of Dutch, were not raised bilingually from birth, and had no diagnosis of Developmental Language Disorder or Autism Spectrum Disorder. All students and parents of children gave informed consent. The study was approved by the Research Ethics Committee (CETO) of the University of Groningen.

2.2. Materials and procedure

2.2.1. Irony task

The irony task had a 2x2 within-subjects design with conditions UTTERANCE (ironic, literal) and EXPECTATION (norm-based, situation-based), with twelve test items in total (three per condition). Test items consisted of stories, featuring two story characters, with three context sentences and one final utterance containing a literal or an ironic criticism (see Table 1 for translations of the Dutch materials). The third context sentence described a change of event which was either a violation of a norm-based expectation, caused by a story character (e.g., cheating during a game), or a violation of a situation-based expectation, caused by a non-human force (e.g., eating an apple that is rotten from the inside). One practice item and three filler items were included that contained a realized expectation, followed by a literal compliment. Each story was followed by five questions examining participants' understanding of speaker belief, speaker motivation (i.e., a justification of the speaker's utterance), speaker intention, speaker attitude, and participant belief (a control question). The speaker attitude question had to be answered by pointing to one of six smileys on a 6-point scale ranging from *very happy* to *very angry*. All other questions had to be answered orally.

Stories and questions were prerecorded. Final utterances were pronounced with stress on the evaluative expression. Ironic utterances were pronounced with a natural ironic intonation, with a longer duration of the expression compared to

its literal equivalent (Chen & Boves, 2018). Literal utterances were pronounced with a natural factual intonation. Within participants, test and filler items were semi-randomly distributed. Across participants, test items were examined in both utterance conditions. Eight versions of the materials were used to balance utterance (ironic vs. literal), item order (item 1-16 vs. item 16-1), and order of evaluative expressions in questions (e.g., “good or bad” vs. “bad or good”).

Table 1. Examples of items with a violation of a norm-based expectation and a situation-based expectation, followed by an ironic (bold left term) or literal (bold right term) utterance. Questions assessed understanding of speaker belief (Q1), motivation (Q2), intention (Q3), attitude (Q4), and participant belief (Q5).

	Norm-based expectation	Situation-based expectation
	Anna and Tom are making music. They are playing on Anna’s new drum. Tom is beating the drum so hard, that he punches a hole in it. Anna says:	Lucas and Tess are in the park. They are going to picnic. All of a sudden it starts to rain. Lucas says:
	“You are so careful/reckless with other people’s belongings!”	“Such a good/bad weather for a picnic!”
Q1	Does Anna think that Tom is careful or reckless with other people’s belongings?	Does Lucas think it is good or bad weather for a picnic?
Q2	Why does Anna say that Tom is careful/reckless with other people’s belongings?	Why does Lucas say that it is good/bad weather for a picnic?
Q3	What does Anna want Tom to believe? That Tom is careful or reckless with other people’s belongings?	What does Lucas want Tess to believe? That it is good or bad weather for a picnic?
Q4	How happy or angry is Anna?	How happy or angry is Lucas?
Q5	Do you think that Tom is careful or reckless with other people’s belongings?	Do you think that it is good or bad weather for a picnic?

2.2.2. Antonym task

The antonym task was a sentence completion task eliciting an evaluative expression on the basis of its antonym, such as “If something is not good, it is...” (target: bad). Pairs of evaluative expressions were taken from the test materials of the irony task and were elicited in both directions. Sixteen test items were preceded by four practice items. Four additional practice items were presented to three children who made at least one mistake during the initial practice items.

2.2.3. Social norms interview

The social norms interview was based on the *social events interview* of Ball et al. (2017). Participants listened to descriptions of situations in which friends were playing together (child instruction) or hanging out together (adult instruction). In six test items, social norms were violated. The same norms appeared in the test items of the irony task. In three filler items, social norms were obeyed. Two of these norms appeared in the practice and filler items of the irony task. The third norm was added to balance test and filler items. Participants were asked whether (question 1) and why (question 3) they thought the behavior was good or bad, and whether it was a little bit or very good or bad (question 2).

2.2.4. Procedure

Participants were tested in a quiet room at their school (children) or university (adults). The test session was audiotaped and took approximately 25-30 minutes. Participants received a small present (children) or sweet treat (adults) afterwards.

Irony task – Participants were told that they were going to listen to stories about children who are on an adventure, about which they would answer questions. Prior to the task, it was checked whether they understood the meaning of the smileys that were used for answering speaker attitude question Q4. The experimenter corrected participants when a mistake was made and pointed out smiley characteristics to help them recognize the correct smiley. Participants' understanding was ensured by repeating the part in which a mistake was made. The task was built with Experiment Builder version 2.2.1 (SR Research, 2019). The experimenter pressed keys on a laptop corresponding to participants' answers. Stories and questions were presented via speakers facing the participant.

Antonym task – Participants were instructed that they were going to play a word game about opposites. They were asked whether they knew what an opposite was. A description and two examples were provided before the task started.

Social norms interview – Participants were told that the final task was about playing (child instruction) or meeting (adult instruction) with friends. They were asked to answer questions about things that can happen during playing or meeting.

2.3. Scoring and coding

Irony task – Answers to the belief and intention questions were scored as 1 (correct) or 0 (incorrect). Answers to the attitude question were scored as 1 (very happy), 2 (happy), 3 (a little happy), 4 (a little angry), 5 (angry), or 6 (very angry), and subsequently as 1 (correct) or 0 (incorrect), with a score between 1-3 being correct for practice and filler items, and a score between 4-6 being correct for test items. Motivation answers were classified based on which ToM level the answer reflected: no ToM (ToM-0), first-order ToM (ToM-1), or second-order ToM (ToM-2). Answers fitting into multiple categories were classified according to the

highest level. Coding resulted in 94.9% consensus between the first author and a second coder. Remaining cases were discussed to achieve final consensus.

Antonym task – Answers were scored as 1 (correct) when being classified as the target answer or an alternative appropriate antonym, and as 0 (incorrect) when being classified as a semantically related answer or an unrelated answer. Coding resulted in 94.2% consensus between the first author and a second coder. Remaining cases were discussed to achieve final consensus.

Social norms interview – Answers were classified as “bad” or “good”, or as “depending on the situation” when participants were unable to choose, or when they gave examples of both situations already after question 1.

3. Results

3.1. Irony task

Speaker belief, intention, and attitude accuracy data were analyzed with binomial mixed-effects logistic regression models with function `glmer()` from the `lme4` package (Bates et al., 2015) in R 3.6.3 (R Core Team, 2020). Speaker attitude ratings and speaker motivation data were analyzed with ordinal mixed-effects logistic regression models with function `clmm()` from the `ordinal` package (Christensen, 2019). Model selection was conducted via forward stepwise comparison. For adults, only speaker attitude ratings and speaker motivation data were statistically analyzed due to ceiling level performance on all other questions (see Table 2). Also, children’s answers to the participant belief question (see Table 2) were not statistically analyzed due to ceiling level performance.

3.1.1. Speaker belief and speaker intention

Speaker belief – For children (see Table 2), the best model included fixed effects `UTTERANCE` and `EXPECTATION`¹, and a random intercept for participant. The effect of `UTTERANCE`² was significant ($\beta=4.3555$, $SE=0.7989$, $z=5.452$, $p<.001$), with better performance on literal items than ironic items. We found no effect of `EXPECTATION` ($\beta=0.6423$, $SE=0.4376$, $z=1.468$, $p=0.1422$).

Speaker intention – For children (see Table 2), the best model included fixed effects `UTTERANCE`, `EXPECTATION`, and `TRIAL ORDER`, an interaction between `UTTERANCE` and `EXPECTATION`, a random intercept for participant, and a by-participant random slope for `EXPECTATION`. In an interaction between `UTTERANCE` and `EXPECTATION` ($\beta=-2.6478$, $SE=1.0039$, $z=-2.638$, $p<.01$), literal utterances decreased the chances of a correct answer on items with norm-based expectations compared to items with situation-based expectations. The main effect of

¹ `EXPECTATION` did not improve the model but was kept in as it was part of our hypothesis.

² This effect might become non-significant when a by-participant random slope would be added to the model. Unfortunately, fitting a complex random-effects structure was not possible, possibly due to categorical data and a limited number of items. Therefore, in our analyses, we followed Matuschek et al. (2017) by creating parsimonious models.

UTTERANCE was significant, with better performance on literal items than ironic items ($\beta=4.4598$, $SE=0.9196$, $z=4.850$, $p<.001$, when the reference level of EXPECTATION is situation-based expectations). The main effect of EXPECTATION (i.e., lower accuracies for norm-based expectations) was not significant ($\beta=-1.5608$, $SE=0.8292$, $z=-1.882$, $p=.0598$, when the reference level of UTTERANCE is ironic). A significant effect of TRIAL ORDER ($\beta=0.1582$, $SE=0.0355$, $z=4.452$, $p<.001$) shows that children's performance increased throughout the experiment.

Table 2. Mean accuracies (SD) on speaker belief (Q1), speaker intention (Q3), speaker attitude (Q4), and participant belief (Q5) questions.

		Ironic criticisms		Literal criticisms	
		Norm-based expectations	Situation-based expectations	Norm-based expectations	Situation-based expectations
Adults	Q1	95 (22)	98 (13)	100 (00)	98 (13)
	Q3	98 (13)	98 (13)	100 (00)	98 (13)
	Q4	97 (18)	93 (25)	100 (00)	100 (00)
	Q5	100 (00)	98 (13)	100 (00)	98 (13)
Children	Q1	85 (36)	79 (41)	98 (13)	99 (09)
	Q3	61 (49)	72 (45)	83 (38)	98 (15)
	Q4	85 (36)	66 (48)	98 (13)	94 (23)
	Q5	96 (20)	97 (18)	97 (18)	100 (00)

3.1.2. Speaker attitude

For children's accuracy data (see Table 2), the best model included fixed effects UTTERANCE, EXPECTATION, and GENDER, and participant as random intercept. The effect of UTTERANCE was significant ($\beta=3.5522$, $SE=0.5418$, $z=6.557$, $p<.001$), with better performance on literal items than ironic items. The effect of EXPECTATION was also significant ($\beta=1.9307$, $SE=0.4233$, $z=4.561$, $p<.001$), with better performance on items with norm-based expectations than items with situation-based expectations. A significant effect of GENDER ($\beta=2.2644$, $SE=1.0439$, $z=2.169$, $p<.05$) indicates that boys ($M=.93$, $SD=.26$) performed better than girls ($M=.81$, $SD=.39$).

For analyses of ratings (see Table 3), only items with correct speaker belief and intention understanding were included to ensure that ironic statements were interpreted as ironic (and not as literal statements for example, which could reverse the perceived valence of emotions). For adults, the best model included UTTERANCE³ and EXPECTATION as fixed effects, participant and item as random intercepts, and by-participant random slopes for UTTERANCE and EXPECTATION. Adults were significantly more likely to indicate a more negative attitude when

³ UTTERANCE did not improve the model but was kept in as it was part of our hypothesis.

norm-based expectations rather than situation-based expectations were violated ($\beta=1.5933$, $SE=0.7776$, $z=2.049$, $p<.05$). Judgments did not differ by UTTERANCE ($\beta=0.3670$, $SE=0.5334$, $z=0.688$, $p=.4914$). For children, the best model included fixed effects UTTERANCE and EXPECTATION, and participant and item as random intercepts. Children were significantly more likely to indicate a more negative attitude when norm-based expectations rather than situation-based expectations were violated ($\beta=1.3188$, $SE=0.4104$, $z=3.214$, $p<.01$), and in literal items than in ironic items ($\beta=0.5498$, $SE=0.2191$, $z=2.509$, $p<.05$).

Table 3. Mean ratings (SD) on speaker attitude question (Q4). Ratings are on a 6-point scale, ranging from *very happy* (1) to *very angry* (6).

	Ironic criticisms		Literal criticisms	
	Norm-based expectations	Situation-based expectations	Norm-based expectations	Situation-based expectations
Adults	4.81 (0.90)	4.56 (0.99)	4.95 (0.53)	4.58 (0.67)
Children	5.03 (0.79)	4.38 (1.00)	4.98 (0.84)	4.60 (0.80)

Table 4. Adults' and children's ToM level of answers in numbers (and rounded percentages) on speaker motivation question (Q2).

	Adults		Children	
	Norm-based expectations	Situation-based expectations	Norm-based expectations	Situation-based expectations
ToM-0	16 (27)	14 (23)	68 (54)	84 (67)
ToM-1	05 (08)	08 (13)	48 (38)	33 (26)
ToM-2	39 (65)	38 (63)	10 (08)	09 (07)

3.1.3. Speaker motivation

Adults' answers consisted of 25% ToM-0 answers ($n=30$), 11% ToM-1 answers ($n=13$), and 64% ToM-2 answers ($n=77$). Children's answers consisted of 60% ToM-0 answers ($n=152$), 32% ToM-1 answers ($n=81$), and 8% ToM-2 answers ($n=19$). In a model with GROUP as fixed effect and participant as random intercept, the ToM level of answers was significantly lower for children than for adults ($\beta=-4.1207$, $SE=.7687$, $z=-5.361$, $p<.001$). Effects of expectation were investigated per group (see Table 4). For adults, the best model included EXPECTATION⁴ as fixed effect and participant as random intercept. No effect of EXPECTATION was found ($\beta=0.0029$, $SE=.4683$, $z=0.006$, $p=.995$). For children, the best model included EXPECTATION as fixed effect and participant as random intercept. Answers of a higher ToM level were significantly more likely for items

⁴ EXPECTATION did not improve the model but was kept in as it was part of our hypothesis.

with norm-based expectations than for items with situation-based expectations ($\beta=0.8273$, $SE=.3226$, $z=2.565$, $p<.05$).

3.1.4. Speaker attitude: additional analysis

In section 3.1.2, speaker attitude understanding (accuracy on Q4) was examined regardless of children's speaker belief and intention understanding. In order to examine when in their development children understand the ironic speaker's emotion (once they understand the speaker's belief, or the speaker's belief and intention), we performed an additional analysis. Items for which children showed no belief or intention understanding (Incorrect B+I) were separated from items for which they showed only belief understanding but no intention understanding (Correct B), and items for which they showed both belief and intention understanding (Correct B+I) (see Table 5). The best model included BIGROUP⁵, EXPECTATION, and GENDER as fixed effects, and a random intercept for participant. The effect of BIGROUP was significant, with children with incorrect belief and intention understanding ($\beta=-10.4584$, $SE=2.7609$, $z=-3.788$, $p<.001$) and children with correct belief understanding ($\beta=-2.7280$, $SE=1.1827$, $z=-2.307$, $p<.05$) being less accurate than children with correct belief and intention understanding. Children with incorrect belief and intention understanding were also less accurate than children with correct belief understanding ($\beta=-7.7304$, $SE=2.3442$, $z=-3.298$, $p<.001$). A significant effect of EXPECTATION shows better performance on items with norm-based expectations than on items with situation-based expectations ($\beta=4.1590$, $SE=1.1929$, $z=-3.487$, $p<.001$). A significant effect of GENDER shows better performance for boys ($M=.86$, $SD=.35$) than girls ($M=.67$, $SD=.47$) ($\beta=2.5703$, $SE=1.2928$, $z=1.988$, $p<.05$).

Table 5. Children's mean accuracies (SD) on speaker attitude question (Q4) for ironic items based on speaker belief (B) and speaker intention (I) understanding.

	Norm-based expectations			Situation-based expectations		
	Total	Boys	Girls	Total	Boys	Girls
Incorrect B+I	11 (32)	50 (58)	00 (00)	04 (20)	14 (38)	00 (00)
Correct B	93 (25)	93 (26)	93 (26)	67 (50)	57 (53)	100 (00)
Correct B+I	100 (00)	100 (00)	100 (00)	84 (36)	93 (27)	78 (42)

3.2. Antonym task

Adults were 96.6% correct (74.1% target, 22.5% alternative antonym) and gave 1.6% semantically related and 1.9% unrelated answers. Children were 66.5%

⁵ Where BIGROUP stands for correct versus incorrect belief (B) and/or intention (I).

correct (47.5% target, 19.0% alternative antonym) and gave 6.3% semantically related and 27.2% unrelated answers. Children's antonym production was positively but not significantly correlated with speaker belief ($r=.236$, $p=.1322$) and speaker intention understanding ($r=.172$, $p=.2755$) in ironic items.

3.3. Social norms interview

Adults gave 92.4% "bad", 2.5% "depending on the situation", and 5.1% "good" answers. Children gave 98% "bad", 1.2% "depending on the situation", and 0.8% "good" answers, which indicates mature knowledge of social norms.

4. Discussion

In this study, we examined how different types of expectations contribute to children's understanding of irony. We expected better irony understanding when norm-based rather than situation-based expectations were violated.

Speaker belief understanding was similar for violations of norm-based expectations and situation-based expectations, probably because most children understood the speaker's belief, which is in line with earlier studies with children of a similar age (e.g., Filippova & Astington, 2008; Whalen & Pexman, 2010).

Contrary to our expectations, *speaker intention understanding* was more difficult when norm-based expectations rather than situation-based expectations were violated. Surprisingly, this effect was more pronounced for literal than for ironic items. Thus, understanding speaker intentions in response to violations of norm-based expectations seems to be a general difficulty, regardless of the presence of irony. A concern with respect to the unexpected low performance on literal items could be that children had difficulties with parsing the structure of the second-order intention question. Ceiling level performance on literal items with situation-based expectations eliminates this possibility. What makes reasoning about intentions in relation to social norms difficult? It is not a lack of knowledge of social norms, as children demonstrated accurate knowledge in the social norms interview. We list three possible options that require further examination. First, it could be that children reason about how a speaker wants the listener in the story to *behave*, instead of what the speaker wants the listener in the story to *believe* about their behavior, which could be prompted by their moral awareness. For situation-based expectations, reasoning as such is not possible, as no behavior is involved. Second, reasoning might be more difficult when a criticism is directed at a target (in norm-based expectation violations) compared to when it is not (in situation-based expectation violations). Third, an asymmetry in outcome for story characters might be of influence: whereas in situation-based expectation violations the outcome is bad for both characters, in norm-based expectation violations, one person causes a bad outcome for the other.

In line with our expectations, *speaker attitude understanding* was better when norm-based rather than situation-based expectations were violated. Perhaps, early exposure to social norms helps children to assess the speaker's feelings, as has

been argued for other attitude aspects (Filippova & Astington, 2010). As children and adults judged emotions as more negative when norm-based expectations were violated, evoked emotions seem to be stronger when a person's behavior rather than a situation's outcome does not comply with prior expectations. Possibly, this is determined by the presence (in norm-based expectations) versus absence (in situation-based expectations) of a target of irony, as adults have been found to judge emotions of ironic speakers as more negative in utterances with than without a target (Leggitt & Gibbs, 2000). The additional finding of children's less negative emotion judgments for ironic compared to literal items could reflect early sensitivity to the muting function of irony (Dews & Winner, 1995). The absence of this effect for adults might be due to violations being too child-like in order to be "bad" enough for adults to judge speakers as very angry, leading to smaller judgment differences between literal and ironic items.

Speaker motivation explanations (i.e., children's reasoning about why a speaker used an ironic utterance) more often referred to a higher ToM level when norm-based rather than situation-based expectations were violated. Possibly, violations which affect social relations trigger the use of mental states, whereas for violations that do not, a zero-order reference to the factual situation suffices.

In an additional analysis, we tried to determine at what moment in children's development they are able to understand the ironic speaker's emotion: before or after speaker intention understanding develops. For norm-based expectations, children with speaker belief understanding but without speaker intention understanding correctly understood the speaker's emotion in 93% of the cases. For situation-based expectations, this was found for 67% of the cases. Whereas this difference might be the result of benefits of early exposure to norms, a larger group of children with correct belief and incorrect intention understanding should be assessed, as there were only 9 data points for situation-based expectations, compared to 30 data points for norm-based expectations (making the results for the later more trustworthy). Despite the outcome for situation-based expectations being less pronounced, the results suggest that understanding of the speaker's belief is sufficient to understand the speaker's emotion.

Although investigating possible effects of gender was not part of our research question, we found that speaker emotions were better understood by boys than girls. As the results are not uniform across conditions (see Table 5) and the number of data points for some comparisons was limited, this finding needs to be verified. A further finding was that speaker intention understanding increased during the experiment, suggesting that intention attribution has not been automatized yet, and that repetitive exposure to similar contexts can cause a learning effect. We did not find any age effects, which is not surprising given the limited age range. Also, no relation was found between irony comprehension and antonym production, suggesting that the development of irony comprehension is not affected by children's lexical knowledge of the evaluative expression.

Together, the results suggest that speaker attitude understanding and speaker motivation explanations benefit from children's knowledge of norms. In contrast, norm-based expectations seem to increase the difficulty with speaker intention

understanding, although reasoning about intentions in social situations, regardless of the presence of irony, seems to be difficult in general. Speaker belief understanding was not influenced by the type of expectation. The findings show that norm-based expectations and situation-based expectations differ in their influence on different steps in children's understanding of verbal irony.

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