



# Public Stigma of Autism Spectrum Disorder at School: Implicit Attitudes Matter

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## Abstract

This study examines the public stigma of children with autism spectrum disorder (ASD) by their school-aged peers, focusing on both explicit and implicit attitudes. The twofold aims were to provide a broader picture of public stigma and to explore age-related changes in attitudes. Students completed an explicit measure of the public stigma and an implicit measure of attitudes after watching a video displaying children with ASD vs. typically developing (TD) children. Both measures showed more negative perceptions towards children with ASD compared to TD children. However, while explicit attitudes improved with age, implicit attitudes remained constantly negative. This finding suggests that both explicit and implicit attitudes should be considered when promoting an inclusive climate at school.

**Keywords** Explicit and implicit attitudes · School inclusion · Public stigma · Autism spectrum disorder

Autism spectrum disorder (ASD) affects a growing number of children (prevalence of 1 out of 59 eight-year-old school children, Baio et al. 2018) and efforts have been made to include them in regular classroom contexts (e.g., Fuchs and Fuchs 1994). However, while enrollment in school is the first step towards inclusive education, it is not the sole guarantor of its success (Pellicano et al. 2018). Although there has been a significant development of initiatives designed to improve the social inclusion of children with ASD, they are still more likely than their peers to be stigmatized (e.g., Humphrey and Hebron 2015).

Public stigma refers to individuals' reactions to people that they perceive as being different from them (e.g., with a mental disability). Public stigma includes stereotypes (i.e.,

cognitive component), attitudes (i.e., affective component) and discrimination (i.e., behavioral component) (Corrigan and Watson 2002). Regarding attitudes (also called “prejudice”), the negative evaluation of persons with disability represents a serious obstacle to their inclusion (e.g., Humphrey and Hebron 2015; Swaim and Morgan 2001). A child with ASD is more likely to be perceived negatively by other children and by teachers than a Typically Developing (TD) child (e.g., Abu-Hamour and Muhaidat 2014; Humphrey and Hebron 2015; Park and Chitiyo 2011; Swaim and Morgan 2001). Moreover, experiences of discrimination, such as bullying at school, are very frequent among children with ASD (Cappadocia et al. 2012; Hwang et al. 2018; Zablotsky et al. 2013). This is partly explained by the contrast between the absence of apparent physical differences in most children with ASD and their atypical behaviors (Gray 1993, 2002; Lilley 2013). Because children with ASD often look like neurotypical children, people expect that they behave in a typical way. Hence, the contrast between how these children should act and how they really act trigger negative attitudes and exclusion. Finally, people with a disability suffer from ambiguous stereotypes, as they are perceived as being warm but not competent (Fiske et al. 2002; Rohmer and Louvet 2012). This result has been explained by the “compensation effect”, meaning that people compensate a negative judgment on one dimension (here, the competence dimension) by a positive judgment in another dimension (here, the warmth

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dimension; Yzerbyt 2018). Importantly, Rohmer and Louvet (2012) found that this effect also occurred for judgment towards adults with ASD. However, no research has so far specifically explored this issue in children. It is problematic because while autism awareness has recently increased in the adult population, it seems that elementary school children still do not know what autism is or has approximate knowledge (Dillenburger et al. 2017; Magiati et al. 2002). This ignorance, unfortunately, forms a fertile ground for the development of negative attitudes and affects inclusion of children with ASD. It is therefore crucial to gain a better understanding regarding the development of public stigma against children with ASD, in order to improve their inclusion.

Most studies exploring public stigma towards children with ASD have used self-report questionnaires (Abu-Hamour and Muhaidat 2014; Park and Chitiyo 2011; Swaim and Morgan 2001). This kind of measure (i.e., explicit measure) has two main limitations highlighted in multiple studies about stigma. Firstly, self-report questionnaires can be sensitive to social desirability bias (i.e., the tendency to present oneself in a positive light; Crowne and Marlowe 1960). Indeed, expressing attitudes, stereotypes or behavioral intentions is an explicit and controlled act, so respondents can alter their answers. Respondents, including children, may try to seem unprejudiced—whatever their inner attitude—because they are aware of social norms that condemn discrimination (Rutland et al. 2005). For example, Manetti, Schneider and Siperstein (2001) showed a discrepancy between children's declarations and their observed behaviors. Although they declared to be likely to include a hypothetical child with a disability in their classroom, sociometrics revealed behaviors of rejection towards a real child with disability who was integrated in their classroom. In the same way, Swaim and Morgan (2001) showed that when 9 year-old children answered questions about what they believed their classmates' perspective was concerning children with ASD, they reported more negative attitudes than when they answered questions about their own perspective of these children. Moreover, desirability bias seems to increase as children grow older (Rutland et al. 2005). Indeed, research has shown that young children spontaneously report more positive attitudes towards members of their own groups compared to members of other groups (e.g., Baron and Banaji 2006; Kinzler et al. 2009). This preference (the ingroup bias; Mullen et al. 1992; Sumner 1906) appears early in development, emerging at around three years old and reaching its peak at around five or six (Aboud 2003; Corrigan et al. 2007). However, older children seem to be more motivated to inhibit the ingroup bias as they grow up due to their growing understanding of social norms (Rutland et al. 2005).

The second limitation of explicit measures of public stigma is that they tend to predict just one type of

discrimination behavior. Indeed, discrimination can manifest in two different ways. It can be overt with intentional unequal treatment (e.g., insult) but it can also manifest in more subtle behaviors such as non-verbal signals (e.g., increased physical distance) (Jones et al. 2016). This latter type of discrimination “encompasses behaviors that are seemingly normal, natural, or acceptable, often unintentional, perceived as trivial and harmless, and not unlawful.” (Jones et al. 2016, p. 1591). These behaviors are not seen as offensive by the person who expresses them but can be seen as demeaning by the outgroup member (Sue et al. 2007; e.g., continuing to mispronounce the Spanish name of a student after having corrected the teacher time and time again). Whereas overt behaviors are generally under one's control, subtle behaviors are more pervasive and harder to control (Dovidio et al. 2002; Sue 2010). Although traditional and overt forms of discrimination have tended to decrease in France, in part because they are socially and legally repressed, especially in the educational system (Thibert 2014), this is far from being the case for subtle forms of discrimination. A recent study showed that people suffering from a mental illness often experience subtle harmful behaviors (Gonzales et al. 2015). This kind of behavior is at least as deleterious for the victim as overt discrimination (Jones et al. 2016) in terms of decreased quality of life, low self-esteem, and altered psychological and physical health (Lewis et al. 2006; Lim and Cortina 2005; Utsey et al. 2002). Being able to identify, predict, and change subtle discrimination is therefore crucial for developing an authentically inclusive climate at school.

Because of the reasons listed above, relying on explicit measures of public stigma to prevent discrimination is insufficient as they are predictive of overt discrimination but are very poor predictors of subtle discrimination (Dovidio et al. 2002). Implicit measures, by contrast, are better predictors of these subtle behaviors (Dovidio et al. 2002), even in socially sensitive domains such as disability (Greenwald et al. 2009). Implicit measures allow to capture one of the three components of public stigma, namely attitudes. Implicit attitudes are “introspectively unidentified (or inaccurately identified) traces of past experience that mediate favorable or unfavorable feeling, thought, or action toward social objects” (Greenwald and Banaji 1995, p. 8). Implicit and explicit attitudes are today considered to be dissociated from one another. This dissociation has been observed many times amongst various intergroup attitudes, such as Blacks/Whites or people with/without disability (e.g., Rohmer and Louvet 2012; Dovidio et al. 2002; Dunham et al. 2011). Accordingly, since each measure is predictive of a different kind of discrimination, both should be assessed to observe the full range of children's behaviors towards their peers with ASD (Kahneman and Egan 2013). Disregarding measures of implicit attitudes towards children with ASD would be

ignoring these subtle reactions and their deleterious consequences (Jones et al. 2016).

A great number of measures have been developed to capture implicit attitudes (Fazio and Olson 2003). Among them, approach-avoidance tasks measure spontaneous approach and avoidance reactions towards stimuli. These approach-avoidance tendencies represent crucial responses to the environment (e.g., avoidance of a dangerous animal, or approach for reproduction; Chen and Bargh 1999; Krieglmeier and Deutsch 2010). A negative stimulus generally triggers a spontaneous avoidance tendency (e.g., a snake, or someone we don't like) whereas a positive stimulus triggers a spontaneous approach tendency (e.g., food, baby; Chen and Bargh 1999; Krieglmeier et al. 2013; Rinck and Becker 2007; Solarz 1960). Approach-avoidance tasks are commonly used to capture implicit attitudes towards stigmatized groups (e.g., homosexuals; Clow and Olson 2010). In these tasks, participants have to move away or toward a stimulus displayed on the screen, depending on its respective category. Stimuli can be, for example, positive vs. negative images or pictures of two different group members. Depending on the task, participants respond by pressing a button to move a manikin forward or backward or by pushing or pulling a joystick giving the impression that the stimulus is getting closer or farther. In terms of results, participants are generally faster to approach positive stimuli and to avoid negative compared to avoid positive stimuli and to approach negative ones. Among approach-avoidance tasks, the Visual-Approach/Avoidance-by-the-Self-Task (VAAST) has proved to be the most efficient task to capture approach and avoidance tendencies (Rougier et al. 2018). In addition to its strong reliability, this task is particularly appropriate for measuring children's spontaneous reactions because it is easily adaptable for children and fun to use (looks like a video game).

Improving inclusion requires a better understanding of TD children's attitudes, stereotypes, and discrimination towards children with ASD. The present study addresses this stake by (1) capturing a broader picture of public stigma of children with ASD by their peers and (2) exploring the age-related changes of attitudes amongst TD students (from 7 to 12 years old) towards their peers with ASD.

The first objective was to measure explicit attitudes, discrimination (through behavioral intentions), and stereotypes held by TD children concerning their peers with ASD, and, secondarily, perceived similarity. We hypothesized that explicit attitudes and behavioral intentions towards children with ASD would be more negative than towards TD children. Regarding stereotypes, we measured the degree of warmth and competence perceived in children with ASD by their TD peers. Based on previous research on adult samples (Fiske et al. 2002; Rohmer and Louvet 2012), we expected that children with ASD would be judged to be warmer but

less competent than TD children. Because children early know the social norms that condemn discrimination, we hypothesized that children, like adults, would compensate for their judgment (Rutland et al. 2005). Finally, we measured perceived similarity between TD children and their peers with ASD because research has shown that individuals tend to reject people who are perceived as dissimilar to themselves as opposed to those perceived as similar (e.g., Lerner and Agar 1972). We therefore expected that children with ASD would be judged by their TD peers as less similar to themselves than other TD children. To examine attitudes at an implicit level, we measured spontaneous approach and avoidance tendencies. We predicted that implicit attitudes towards children with ASD would be more negative than those towards TD children.

The second objective of the present study was to examine how both explicit and implicit attitudes evolve throughout primary school. Using a cross-sectional design, we expected older children to be more prone to social desirability bias, leading to a decrease in negative attitudes with age, but only on the explicit measures. On the implicit attitudes measure, however, the negative attitudes should be maintained across age because the implicit measure prevents participants' control over responses. By providing a better understanding of attitudes towards children with ASD at an early stage of the educational system, we aim to lay the groundwork for recommendations about better inclusion.







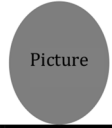
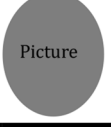
## Method

### Participants

The study involved five regular classrooms of an elementary school located in a French city. A total of 137 participants in second to fifth grade voluntarily took part in the study. This final sample size was dependent on parental consent of their children's participation. Participants ranged in age between 7.08 to 11.67 years with a mean age of 9.28 ( $SD = 1.17$ ). Girls represented 51% of the final sample ( $N = 70$ ). According to the information given by the school staff, no participant was known to have ASD. Due to the absence of some children during sessions of collective or individual measures, 67 participants completed only the explicit measure, seven only the implicit one, and 63 participants completed both measures.

### Procedure and Material

The present study was approved by the school's academic authorities and took place during school time from February to May 2018. All aspects of the study were in accordance with the ethical standards of both institutional and national

		 Not at all	 Not really	 Blah, I don't know	 Yes, ok	 Yes, fully agree!
Emilie						
Jeanne						

**Fig. 1** Example of one response page of the booklet of explicit measures ("Would you like to invite her to your birthday party?" Inclusive behavior)

research committees, and were consistent with the 1964 Helsinki Declaration and its later amendments. Moreover, an institutional ethics committee approved the research. Master students in psychology participated in data collection. All the students were supervised by researchers who have a PhD in psychology.

First, all parents received an information letter and signed a consent form provided by the school head (eighty-nine percent of pupils returned the signed consent form to their teacher). Second, a child informed consent was also obtained for all participants whose parents agreed. Third, as we expected that TD children may not have a clear picture of characteristics of children with ASD, participants first watched a short video introducing TD children and children with ASD. Fourth, participants completed two measures, an explicit and an implicit one separately. Regarding the third step, the 6'05-min video successively presented three children with ASD and intellectual disability (two girls and one boy;  $M_{age}=8.66$ ;  $SD_{age}=2.08$ ) and three TD children (two girls and one boy;  $M_{age}=8.66$ ;  $SD_{age}=2.08$ ). The images used for the creation of this video were provided by two French associations working with children with ASD. These associations organize regular meetings with children with ASD and TD children around leisure activities on Wednesday afternoon. Parental permission was required to show children's faces.

The video started by displaying individual portraits of each child. To help participants differentiate between children, images of children with ASD were framed with one color and images of TD children were framed with another color (the colors were counterbalanced between classrooms' groups). Then, the video displayed the 6 children in daily life situations one by one. In order to control for exposure duration, each child was shown for 45 to 50 s. For each child, a

feminine voice-off introduced each of them with their first name and stated if the child was "a child with a mental disability" or "a child without a mental disability." The term "autism" was not used because it is unknown among children (Magiati et al. 2002). This was of importance for the implicit attitude measure (see below). Then, the voice-off described scenes in which the child was carrying out activities (e.g., playing, singing). For children with ASD, a psychologist specialized in ASD reviewed the selected images to ensure that they were consistent with typically autistic behaviors such as lack of eye contact, sudden shouts, and flapping. Finally, the video ended by showing images of all children's color-framed portraits. In addition, we verified with the parents that all the children with ASD had received a diagnosis according to international classification criteria (American Psychiatric Association 2013).

### Explicit Measures

In each class, explicit measures were administered collectively by the experimenter in the presence of the teacher. After watching the video, students answered questions about two protagonists from the video. Each student randomly assessed one out of six pairs of children from the video, which always included one TD child and one child with ASD. We created three same-sex pairs and counter-balanced the order of presentation of the two children in the pairs.

The questions were presented one by one on an individual black and white booklet (see Fig. 1). Each question was read aloud by the experimenter and displayed on the digital whiteboard to ensure comprehension, particularly for younger students. Furthermore, a common symbol found on the booklet and on the digital whiteboard helped participants identify the current question. The photo (without

**Table 1** Questions used for explicit measures of public stigma and perceived similarity

Component	Question
Attitude (happiness)	Would you be happy if this child invited you to play at home?
Attitude (happiness)	Would you like to be his/her friend?
Attitude (anxiety)	Would you be worried about sitting next to him/her in class?
Attitude (disgust)	Would you mind drinking in the same glass as him/her?
Attitude (disgust)	Would you like to hold his/her hand when you are lined up in the playground?
Attitude (shame)	Would you mind playing with him/her in the playground?
Behavioral intention	Would you want to invite him/her to your birthday party?
Behavioral intention	Would you choose him/her to be on your team?
Behavioral intention	Would you agree to lend him/her your eraser?
Behavioral intention	Could you share your snack with him/her?
Warmth	Do you think he/she looks friendly?
Warmth	Do you think he/she looks kind?
Competence	Do you think he/she looks smart?
Competence	Do you think he/she is a good student?
Similarity with others	Do you think he/she looks different from the others?
Similarity with the participant	Do you think he/she is different from you?

the colored frame used in the video) and the name of the target child indicated to participants which child they had to evaluate.

For each pair, participants started by responding to one control item for each child to check whether they correctly categorized each child (i.e., “Do you think this child has a disability?”). Then, they answered a series of 16 questions assessing attitudes, behavioral intentions, stereotypes, and perceived similarities (see Table 1). Questions were elaborated after consulting research on public stigma of people with a mental disability (Park et al. 2003; Rüscher et al. 2011; Rohmer and Louvet 2012).

Questions regarding attitudes ( $n = 6$ ) addressed emotional reactions toward people with a mental disability (i.e., happiness, disgust, anxiety, shame to interact with; e.g., Park et al. 2003; Rüscher et al. 2011; Rohmer and Louvet 2012). Four questions assessed inclusive behavior intentions (items were inspired by the Shared Activity Questionnaire measuring behavioral intentions of elementary school children toward a peer, Morgan et al. 1996). Four items (two for each dimension) assessed the stereotype content in terms of warmth and competence (Rohmer and Louvet 2012). Finally, two other questions measured perceived similarity by the participant between the child with ASD and the participant, and between the child with ASD and other children in general. For each question, participants responded on a five-point scale, each point represented by a different smiley (see Fig. 1). The scale was the same for all the questions to avoid misunderstanding. All questions were randomized in five different orders for the five classrooms.

## Implicit Measure

The implicit attitude measure was taken after the explicit one for all participants, either on the same day or one to three days later (the order of children was partly random, partly according to the teacher’s decision depending on the class activity in progress). A group of two to three participants was isolated in a separate room. Each child was placed in front of a laptop computer with one instructor. The instructor first showed the video (the same as for the explicit measures) and then launched the implicit task. The instructor ensured that children understood the task instructions during the trials and, then, stayed to help participants if necessary.

The implicit task was an adapted version of the VAAST (Rougier et al. 2018) for children. The task was programmed on Psytoolkit (Stoet 2010, 2017). We used a 2 (movement: approach vs. avoidance)  $\times$  2 (group category: children with ASD vs. TD children)  $\times$  2 (block order: compatible first vs. incompatible first) design with the first two factors being within-participants and the last variable being randomized between-participants. Participants completed two blocks, a compatible block and an incompatible block, in order to be able to compare their response times for all group category/movement combinations (see Rougier et al. 2018 for further details). More specifically, participants in the compatible block were instructed to approach (by pressing the appropriate key to move forward) pictures of children without a mental disability and to avoid (by pressing the appropriate key to move backward) pictures of children with a mental disability. This block was labeled “compatible block” (standard terminology in approach-avoidance tasks) because attitudes

towards the target group and the required behavior are presumed to match in valence (i.e., children without disability/positive, approach/positive). The VAAST is a recently created task that has shown, amongst approach and avoidance tasks, the best reliability to capture spontaneous approach and avoidance towards social groups (Rougier et al. 2018). However, it has not yet been established whether the group category has to be known by participants before performing the task to observe effects or not. Given that autism is unknown among children (Magiati et al. 2002), the label was broadened to “mental disability” to secure the effect.

In the incompatible block (standard terminology in approach-avoidance tasks), instructions were reversed. Participants had to approach children with a mental disability and to avoid children without a mental disability by pressing corresponding keys. This time, attitudes towards the target group and the required behavior are presumed not to match in valence (i.e., children without disability/positive, avoidance/negative), hence the name “incompatible block.” A total of 42 pictures were randomly presented once within each test block, so that each test block included 42 trials. The set of stimuli included seven pictures of each child presented in the video (i.e., three children with ASD and three TD children). Before each test block, participants performed a training phase of 12 trials over 12 pictures (six of children with ASD and six of TD children) which were not subsequently presented in the test block.

The procedure of the VAAST was as follows. Lilou, a virtual character, provided written instructions to participants. For younger children, the experimenter read the instructions aloud. Lilou indicated that they would be immersed in a virtual environment in which they would be able to move forward or backward by pressing the up arrow or the down arrow keys of the keyboard respectively. For each trial, the background was a street, and a centered white circle was displayed on the screen to indicate the beginning of the trial. Then, a picture (surrounded with a color frame depending on the condition) replaced the white circle and was displayed until the participant gave a response. When participants pressed the up arrow button (to move forward) or the down arrow button (to move backward), the whole visual environment was replaced by another (i.e., another screenshot taken ahead of or behind the initial position in the 3D virtual street) and the picture was zoomed in or zoomed out by approximately 20%, giving the visual impression to participants that they were moving towards or away from the picture in the street (see Rougier et al. 2018 for more details). After each trial received a response, the picture disappeared and a new trial started after a 200 ms delay.

At the end of the VAAST, participants completed a categorization task to check that they had correctly identified the category of each target child presented in the VAAST. Participants saw pictures of the six children one by one and

had to decide, for each picture, if the child had a mental disability or not by pressing a key (i.e., left /right arrow).

## Results

### Explicit Measures

#### Data Preparation

A total of 130 participants completed explicit measure of public stigma (32 children in second grade, 32 in third grade, 37 in fourth grade and 29 fifth grade). Data of one participant was excluded because of too many missing answers on the explicit measure (five out of 17 items were missing, making answers on TD children particularly unreliable). Additionally, we checked for the control item. We computed an index by subtracting the score for children with ASD to the score for TD children. No participant scores were positive on this index indicating that no participant evaluated TD children as more disabled than children with ASD.

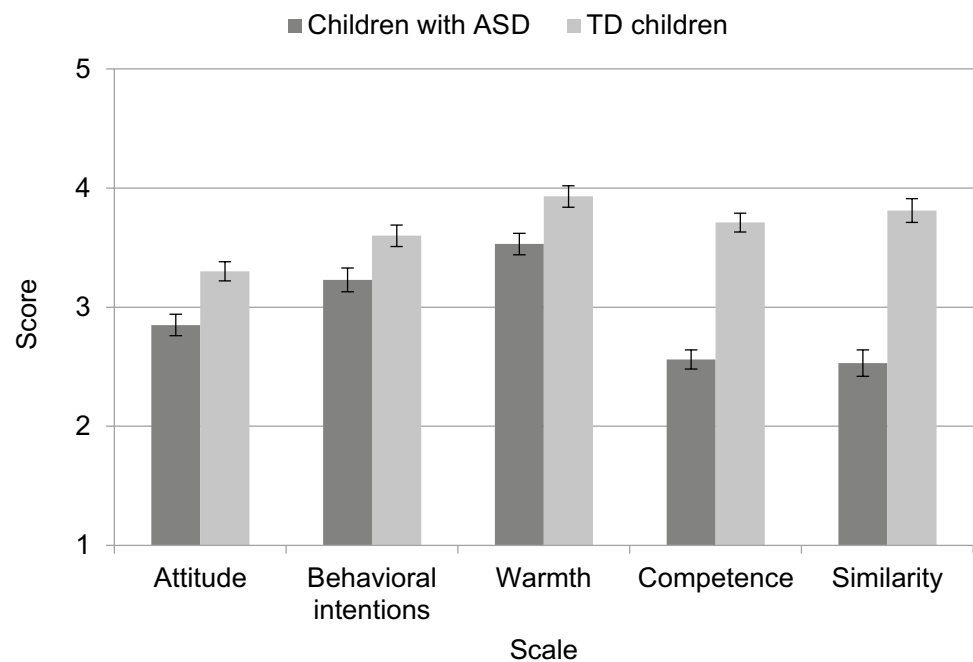
Firstly, the reliability of each scale was checked. For attitudes, behavioral intentions, and stereotypes, we separately performed a principal component analysis and calculated Cronbach's alpha (see Table 2). For the six items measuring attitudes (three negative items were reversed coded), one factor with eigenvalue superior to one (eigenvalue = 3.27) emerged explaining 64% of variance (factor loadings > 0.73;  $\alpha = 0.81$ ). We followed the same procedure for the four items measuring behavioral intentions. Results of the principal component analysis revealed one factor with eigenvalue superior to one (eigenvalue = 2.54) explaining 55% of variance (factor loadings > 0.51;  $\alpha = 0.82$ ). Finally, the principal component analysis on the four stereotype items revealed the two expected factors, namely warmth (eigenvalue = 1.59; factor loadings > 0.84) and competence (eigenvalue = 1.52; factor loadings > 0.82), explaining 40% and 38% of variance respectively. Moreover, because there were only two items to measure similarity, we looked at their correlation, which has been proved to show good reliability ( $r = 0.54$ ,  $p < 0.001$ ). Given the reliability of our scales, we created a unique score for attitudes, behavioral intentions, warmth, competence, and similarity by averaging scores of items of each scale.

#### Data Analysis

We performed several repeated measures ANOVAs with the group category (children with ASD vs. TD children) as the within-participants factor. Each analysis estimated the effect of group category on each component (i.e., attitudes, behavioral intentions, warmth, competence, and similarity). The gender of participants did not interact with any of the components ( $ps > 0.28$ ).

**Table 2** Factor loadings for Principal Component Analysis with varimax rotation

Items	Attitudes	Behavioral Intentions	Stereotypes	
			Warmth	Competence
Attitude (happiness—happy)	.86	–	–	–
Attitude (happiness—friend)	.59	–	–	–
Attitude (anxiety—drink)	.51	–	–	–
Attitude (disgust—hand)	.84	–	–	–
Attitude (disgust)	.83	–	–	–
Attitude (shame)	.72	–	–	–
Behavioral intention (birthday party)	–	.81	–	–
Behavioral intention (team member)	–	.82	–	–
Behavioral intention (lend rubber)	–	.73	–	–
Behavioral intention (share snack)	–	.82	–	–
Warmth (friendly)	–	–	.88	.19
Warmth (kind)	–	–	.84	.26
Competence (smart)	–	–	.21	.86
Competence (good)	–	–	.28	.82

**Fig. 2** Average scores of attitudes, behavioral intentions, warmth, competence and similarity of participants depending on the target group category (5-point scales). The higher the scores, the more positive ratings are. Error bars represent standard errors

All results on explicit scales are presented in Fig. 2. As predicted, participants had more negative attitudes towards children with ASD ( $M = 2.85$ ,  $SE = 0.09$ ) than towards TD children ( $M = 3.30$ ,  $SE = 0.08$ ),  $t(128) = 5.86$ ,  $p < 0.001$ ,  $d_z = 0.52$ . The same pattern was observed for behavioral intentions. Participants reported less inclusive behavioral intentions towards children with ASD ( $M = 3.23$ ,  $SE = 0.10$ ) than towards TD children ( $M = 3.60$ ,  $SE = 0.09$ ),  $t(128) = 4.70$ ,  $p < 0.001$ ,  $d_z = 0.41$ . Children with ASD were also judged to be less warm ( $M = 3.53$ ,  $SE = 0.09$ ) than TD children ( $M = 3.93$ ,  $SE = 0.09$ ),  $t(128) = 3.76$ ,  $p < 0.001$ ,  $d_z = 0.33$ , and also less competent ( $M_{ASD} = 2.56$ ,  $SE = 0.08$ ;

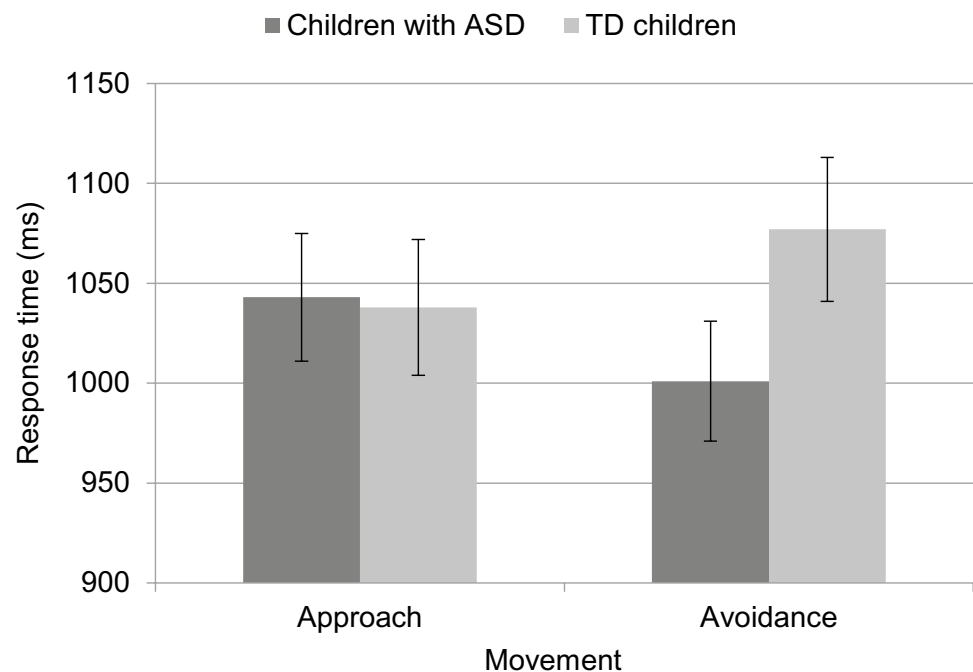
$M_{TD} = 3.71$ ,  $SE = 0.08$ ),  $t(128) = 10.81$ ,  $p < 0.001$ ,  $d_z = 0.95$ . Finally, participants considered children with ASD as more different from themselves and from others ( $M = 2.53$ ,  $SE = 0.11$ ) than TD children ( $M = 3.81$ ,  $SE = 0.10$ ),  $t(129) = 8.47$ ,  $p = 0.01$ ,  $d_z = 0.86$ .

### Implicit Measure

#### Data Preparation

A total of 70 participants completed the VAAST (24 children in second grade, 14 in third grade, and 32 in fourth or

**Fig. 3** Mean response times (in ms) as function of movement (approach vs. avoidance) and group category (children with ASD vs. TD children). Errors bars represent standard errors



fifth grade). The data of three participants were excluded because their scores on the categorization task were too low (three or less correct answers out of six trials), indicating poor differentiation between children with ASD and TD children. Data of three other participants were excluded because their accuracy rate was too low (under 60%). The final sample thus consisted of 64 participants, for whom incorrect responses were excluded from analysis (3.33% of the trials). Before performing the main analyses, we selected cut-off response times in order to maintain a normal distribution, that is, the response times below 500 ms and above 3000 ms were excluded (4.10% of the trials). Finally, we applied an inverse function on response times to normalize their distribution (Ratcliff 1993).

### Data Analysis

Mixed model analyses were performed (Westfall et al. 2014). In terms of fixed factors (i.e. conditions), we estimated the effects of movement, group category, block order variables, and their interactions. As random factors (i.e. with random sampling), we controlled for the random intercept, slopes of movement, group category, their interaction for participants and the intercept and slope of movement for stimuli.

Because random effects are not relevant for our purpose, we only report fixed effects. All the results are provided in milliseconds (ms). Results first showed a main effect of group category, indicating faster response times for children with ASD ( $M = 1022$ ,  $SE = 30$ ) than for TD children ( $M = 1058$ ,  $SE = 34$ ),  $t(63) = -2.24$ ,  $p = 0.03$ ,  $d_z = 0.49$ . The main effect of movement was not significant,  $t(63) = 0.19$ ,

$p = 0.85$ . More interestingly, the predicted interaction of movement  $\times$  group category was significant,  $t(63) = 2.48$ ,  $p = 0.02$ ,  $d_z = 0.31$  (see Fig. 3). Simple effect analysis showed that participants were faster to avoid children with ASD ( $M = 1001$ ,  $SE = 30$ ) than to avoid TD children ( $M = 1077$ ,  $SE = 36$ ),  $t(63) = 3.34$ ,  $p = 0.001$ ,  $d_z = 0.53$ . No difference emerged on approach movement between children with ASD ( $M = 1043$ ,  $SE = 32$ ) and TD children ( $M = 1038$ ,  $SE = 34$ ),  $t(62) = 0.92$ ,  $p = 0.36$ ,  $d_z = 0.03$ .<sup>1</sup>

### Attitudes According to the Age of Participants

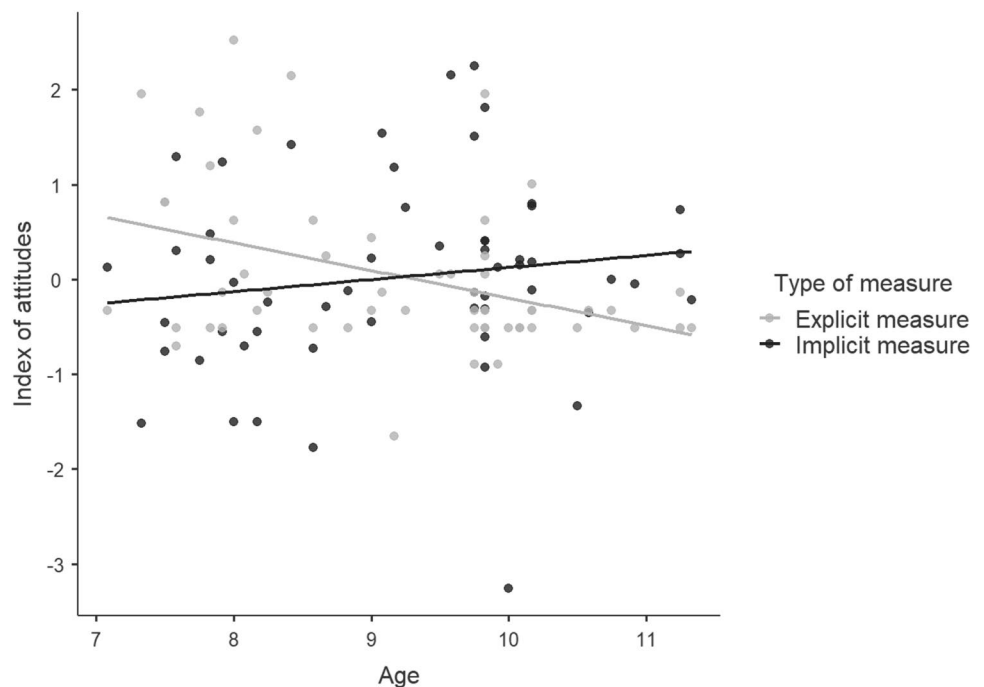
#### Data Preparation

From the two samples, filtered as described in the implicit measure and the explicit measures sections, only participants who completed both measures were included in this analysis. Thus, a total of 56 participants remained in the final sample ( $M_{age} = 9.20$ ,  $SD_{age} = 1.12$ ,  $Min_{age} = 7.08$ ,  $Max_{age} = 11.33$ ; 32 females). To compare the effect of age on implicit vs. explicit attitudes, we created two indexes of attitudes, both reflecting attitudes of participants towards

<sup>1</sup> We provide results on simple effects of movement for each category in the Appendix. We did not describe them in the core text because it is very common to observe a main effect of movement in approach-avoidance tasks (i.e., a faster approach than avoidance reactions; e.g., Krieglmeyer & Deutsch, 2013; Rinck & Becker, 2007) rendering the interpretation of these simple effects irrelevant. Although the main effect of movement is not significant in our study, we still recommend caution when interpreting the results.



**Fig. 4** Index of attitudes as function of participants' age and type of measure. The higher the score, the more negative the attitudes



children with ASD compared to TD children. The implicit attitudes index was computed by subtracting the average score of compatible trials (i.e., approach TD children / avoid children with ASD) from the average score of incompatible trials (i.e., approach children with ASD / avoid TD children). The explicit attitudes index was computed by subtracting the mean scores of explicit attitudes held regarding children with ASD from the mean scores of explicit attitudes regarding TD children. Finally, we transformed the two indexes of attitudes into *z*-scores in order for them to have the same scale. The higher the score, the more negative the attitudes.

#### Data Analysis

We regressed the standardized index of attitudes on age as the between-subject variable (previously centered), the measure type (explicit vs. implicit) as the within-subject variable, and their interaction (see Fig. 4). Results showed no main effects of age,  $t(55) < |1.54|$ ,  $p > 0.12$ , nor of the type of measure,  $t(55) < |0.81|$ ,  $p > 0.42$ . Importantly, the interaction between age and type of measure was significant,  $t(55) = -2.74$ ,  $p = 0.01$ . Simple effects analysis showed that age did not significantly predict implicit attitudes,  $t(55) = 1.07$ ,  $p = 0.29$ , indicating that implicit attitudes did not change with age of participants. However, age significantly predicted explicit attitudes,  $t(55) = -3.07$ ,  $p < 0.001$ . The older the participants, the less they explicitly expressed negative attitudes towards children with ASD while at the same time, the level of implicit attitudes remained stable regardless of age.

#### Discussion

The first goal of the study was to provide a broader picture of public stigma towards children with ASD in the school context. In line with our hypotheses, we found more negative explicit attitudes and behavioral intentions towards children with ASD in comparison to TD children. This finding is in line with results previously observed among children (e.g., Humphrey and Hebron 2015; Swaim and Morgan 2001). Secondly, our hypothesis regarding stereotypes was not fully supported. Although children with ASD were judged to be less competent than TD children, as expected, they were also judged to be less warm. This finding is different from those on adults that showed a compensation effect towards adults with a disability (Fiske et al. 2002; Rohmer and Louvet 2012; Yzerbyt 2018). In other words, adults tend to compensate for their negative judgment regarding others' competence, with a positive judgment regarding their warmth. It does not appear to be the case for children. Thirdly, our results support the hypothesis regarding implicit attitudes. Indeed, primary school children showed more negative implicit attitudes towards children with ASD than towards TD children. Specifically, children were faster to spontaneously avoid children with ASD and approach TD children than the reverse. This result is consistent with previous studies that have identified negative implicit attitudes towards adults with a disability (Rohmer and Louvet 2012; Park et al. 2003; Vaughn et al. 2011).

Beyond offering a broader picture of public stigma towards children with ASD, our second goal was to explore the age-related changes in explicit and implicit attitudes

of TD children towards their peers with ASD throughout elementary school. In accordance with our hypothesis, our cross-sectional design revealed that although explicit negative attitudes towards children with ASD decreased as children became older, implicit attitudes remained constant across the different levels of elementary school. This current work advances our understanding of attitudes towards children with ASD in different ways. Firstly, to our knowledge, this is the first time that attitudes towards children with ASD (and towards individuals with ASD more generally) are measured at an implicit level with a behavioral task. Secondly, although the dissociation between implicit and explicit attitudes is well documented among adults (see Gawronski and Bodenhausen 2006 for a review), few empirical research studies have shown evidence of this effect in children (Rutland et al. 2005). Thirdly, our results highlight how this dissociation between implicit and explicit attitudes towards children with ASD evolves throughout primary school.

By providing a broader picture of attitudes towards children with ASD, our findings highlight the importance of considering both explicit and implicit levels when investigating attitudes. This is especially important in light of the limitations of explicit measures, such as social desirability bias (Dovidio et al. 2001). As shown by our findings, explicit attitudes of children develop positively as children grow older and learn social norms, while implicit attitudes remain stable. Relying only on explicit measures only to assess attitudes towards children with ASD is therefore restrictive and does not capture the whole picture. As an example of this, efforts have been made to improve attitudes towards children with ASD in school context through anti-stigma interventions (e.g., Campbell 2006; Campbell et al. 2004; Godeau et al. 2010; Ranson and Byrne 2014). However, in all these studies, the impact of anti-stigma interventions was measured by observing a change in explicit attitudes of children towards their peers with ASD but no measure was collected at an implicit level. This limits the conclusions regarding the impact of interventions because explicit attitudes may be positively impacted while implicit attitudes may not change. Implicit measures are not often used with children because of the expected long-windedness of the method. But measuring implicit attitudes is not as difficult to program and conduct in the field as one might think. With the development of open-source platforms and free tools, researchers can easily program implicit tasks (e.g., Aubé et al. 2019; Nosek et al. 2007; Stoet 2010, 2017). The tasks can then be completed online or offline in a few minutes and on tablets, which are suitable even for younger children and classroom contexts.

Moreover, measuring implicit attitudes is crucial because explicit and implicit attitudes do not predict the same kind of behaviors. While explicit attitudes predict controlled behavior towards others, implicit attitudes predict more

subtle behaviors that are harder to control (Dovidio et al. 2002). Consequently, when relying only on explicit measures to observe attitudes of children towards their peers with ASD, researchers overlook the importance of subtle forms of discrimination in the inclusion process of children with ASD. Indeed, despite the lack of research on subtle discrimination towards people with ASD, more and more testimonies of victims are published on the Internet through blogs. For example, Laina, a woman with Asperger's syndrome, explained: "Then there are the folks who, during a conversation with other people, disclose the fact that they're Aspergian/autistic, and experience a complete change in demeanor in—and treatment by—the other person. They describe it as a talking down or even like they're being talked to like a child. These were adults who were having a perfectly ordinary conversation a split-second ago." (Earththarher 2017). This testimony as well as the majority of research on subtle discrimination has focused on college and adult populations (e.g., Sue et al. 2007; Sue 2010). In the school context, we found only one study showing that school-aged children from minorities (i.e., children with parents from a sexual minority group) are also victims of subtle discrimination from peers and suffer from it (Farr et al. 2016). One might expect that for children with ASD as well, discrimination might manifest through subtle behaviors such as ignoring them during break time, not choosing them when making a soccer team, or staring at them as if they were really strange. All these behaviors might have consequences on the way children with ASD feel included in the classroom. We hope that future research will continue to investigate subtle discrimination towards children with ASD in the school context. Some avenues of research could consist of developing measures of subtle discrimination towards children with ASD or developing inclusive school programs that take into account subtle behaviors. For instance, although subtle behaviors are difficult to control, talking about these behaviors with children could be a first step to raise awareness about their negative impact and promote more inclusive behaviors. Future research could also directly investigate the feelings of ostracism versus belonging experienced by children with ASD. Indeed, it could be expected that the level of public stigma experienced by children with ASD would directly influence their feelings of ostracism or belonging in the classroom and the school. This is of particular importance as these two psychological variables are strong predictors of academic drop-out and academic achievement (e.g., Walton and Cohen 2007).

Moreover, our results on stereotype content showed that children with ASD were judged to be less warm (i.e., kind, friendly) and less competent (i.e., good at school, smart) than TD children. To our knowledge, this is the first study showing that children with ASD are negatively stereotyped in this way. While literature on attitude and discrimination

towards people with ASD is prolific, literature on the content of stereotypes towards people with ASD is much poor (Draaisma 2009; Huws and Jones 2011; Wood and Freeth 2016), and even more poor regarding children (Dillenburger et al. 2017). Judgment on the dimension of competence is in line with results previously observed in adults (Rohmer and Louvet 2012), but this is not the case for warmth. Unlike adults, children are judged as less warm than their peers. One can hypothesize that children with ASD are not considered as warm as TD children because of their social impairments. According to the stereotype content model (Fiske et al. 2002), the low warmth and low competence stereotypes are most harmful for the victim group. Indeed, social groups stereotyped as inadequately warm and competent elicit contempt that results in passive harm such as nonverbal discrimination but also active harm such as aggressive behaviors (Fiske et al. 2002). This finding emphasizes the importance of considering stereotypes and their deleterious consequences on children with ASD.

### Limitations

As a first-ever study measuring implicit attitudes towards children with ASD, it presents some limitations. A first limitation concerns the fact that the term “autism” was never used during the conduct of the study. Indeed, in the video and in the measures, children with ASD were presented as “children with a mental disability.” However, the video and the pictures used in the implicit task displayed behaviors typical of autism. These behaviors were approved by a psychologist specialized in autism. Consequently, participants might have associated the label “children with a mental disability” with specific autism behaviors. Moreover, Swaim and Morgan (2001) found no differences in ratings of attitudes of TD children towards a child with ASD presented in a video when the child was explicitly labeled as being a “child with autism” compared to a condition where the child was not labeled. This suggests that children tend to rely on images rather than on the label to rate the child. Together, these elements support the claim that our measure directly focuses on children with autism.

A second limitation of this study concerns the diagnosis of children with ASD. All the children presented in the video received a diagnosis of ASD associated with intellectual disability according to the international criteria (APA 2013). The findings on public stigma and implicit attitudes presented in this study are therefore limited to children with such a diagnosis and cannot be generalized to other profiles on the autism spectrum. For instance, behaviors of children with ASD but without an intellectual disability could be very different from those of the children

presented in the video. Consequently, in the case of high functioning autism or Asperger syndrome, one may expect that public stigma would reveal less negative because these individuals tend to be often able to control their atypical behaviors more successfully. Further research should be carried out to obtain a more fine-grained understanding of public stigma across all autism profiles.

### Conclusions

In conclusion, the present results highlight the negative perceptions of children with ASD by their peers, at an explicit level but also at an implicit level. Considering the influence of implicit attitudes on the relationship between children with ASD and TD children at school is crucial for promoting more inclusive behaviors. From a practical perspective, our results should encourage the development of anti-stigma interventions, especially for younger students in primary school. Indeed, most previous studies have targeted older students in high school and college while ingroup bias appears early in the development of children (Aboud 2003). Moreover, the dissociation between what students say and what they actually do becomes more important as they grow older. Consequently, one of the priorities is to act very early to prevent the development of negative attitudes towards children with ASD, when social desirability bias is not yet well developed.

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**Author contribution** BA, AF, CD, and SG conceived and designed the study. BA prepared the tools for implicit measure and the video. BA, AF and CD developed the scale for explicit measure. AF organized the data collection in school and collected the data. BA performed the statistical analyses. BA, AF and CD wrote the article and SG revised it critically.

### Compliance with Ethical Standards

**Conflict of interest** The authors declare that they have no conflict of interest.

**Informed Consent** Informed consent was obtained from all individual participants included in the study. In addition, all procedures performed were in accordance with the ethical standards of the respective institutional and national research committees, as well as with the 1964 Helsinki declaration and its later amendments. Moreover, an institutional ethics committee approved the research.

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