Towards persuasive sociometric technologies for inclusive educational settings

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ABSTRACT

With an increasing interest in the social inclusion of children in schools, HCI researchers have proposed technologies that support children at risk of social exclusion in their interactions with peers. However, much of this work has focused on the child at risk of social exclusion, disregarding the fact that social exclusion is a group-phenomenon that often originates in children's negative stereotyping. In this paper we argue for *persuasive sociometric technologies*, ones that sense children's social interactions in real-time, and provide persuasive, just-in-time recommendations to children with the goal of challenging their perceptions of diversity and motivating pro-social behaviors. We report on two studies that aimed at inquiring into children's practices of social exclusion in school communities as well as whether and how persuasive technologies can stimulate pro-social behaviors and a sense of empathy among them.

Author Keywords

Persuasive sociometric technologies, social inclusion

ACM Classification Keywords

H.5.2 [Information Interfaces and Presentation]: User Interfaces – evaluation/methodology, user-centered design, prototyping.

INTRODUCTION

As a result of a series of declarations for non-discriminatory education [34, 35, 36], equal access to education was recently declared by the United Nations a basic human right [1]. This reignited interest in *inclusive education*, an educational approach that seeks 'Education for All' through developing schools that respond successfully to the diversity of all learners and their different needs [2].

CHItaly '13, September 16 - 20 2013, Trento, Italy

http://dx.doi.org/10.1145/2499149.2499163

Figure 1. Examples of sociometric technologies: (left) children carry mobile phones during playtime that infer pair-wise proximity from Bluetooth signal strength, (right) children use their wristbands including RFID tags to identify themselves and take photos with their friends.

Central to inclusive education is the principle of one-school-for-all, according to which children from diverse educational, cultural, ethnic, socio-economic backgrounds as well as with and without disabilities learn together, under the same roof.

However, while inclusive school communities increase children's exposure to diversity, this does not necessarily eliminate exclusive social practices among them. Empirical findings on the subject are mixed. Inclusive educational environments impact children's attitudes towards social exclusion, primarily based on moral reasoning [3]; yet, practices of social exclusion are still observed on children's behaviors, such as being ignored, being actively excluded from peer activities, or even being verbally or physically harassed [4].

Educational researchers have developed a wide range of strategies for encouraging higher levels of social interaction among children in inclusive schools. These may range from environmental arrangements, to peer imitation techniques and social skills training, as well as peer-mediated intervention and group affection techniques (see [5] for an overview).

Within Child-Computer Interaction, a number of efforts have recently been made towards this goal [6, 7, 8, 9, 37]. For instance, Escobedo et al. [8] proposed a mobile

assistive application that uses augmented reality and visual supports with the goal of supporting students with autism to initiate and maintain social interactions with peers. Similarly, Hendrix et al. [10] developed an interactive tabletop game aimed at helping shy children gain confidence through assuming leading roles in their social interactions with others.

These efforts are certainly an essential step forward and provide promising results. Yet, we argue here that they only account for a limited view on the problem of social exclusion, due to two reasons. First, through focusing on children with particular cognitive, physical disabilities and constraints in their social skills, they provide a limited view on the root cause of social exclusion. Factors that contribute towards children's social participation in school go beyond cognitive and social abilities, to the ethnic, cultural and socio-economic background of the child. Second, in attempting to solve the problem, they focus on improving the skills of the child at risk of social exclusion. Yet, as Harrist [11] argues, social exclusion is a group phenomenon and any interventions, technological or educational, should focus on peers as much as on the child at risk.

In this paper we argue for *persuasive sociometric technologies*, ones that sense children's social interactions in real-time, and provide persuasive, just-in-time recommendations to children with the goal of stimulating pro-social behaviors (see figure 1).

Our work is motivated by the uptake of sensor technology [12] and social network analysis techniques [13]. When combined, these can provide a detailed account of social behaviors in real time. For instance, trends on individual and community-level metrics, such as a child's centrality in her social network, may be inferred in real time. This may provide a basis for just-in-time recommendations that attempt to challenge children's perceptions of diversity and motivate pro-social behaviors.

Yet, limited is known about which persuasive strategies may be the most effective when attempting to affect children's social behaviors. In this paper we present two studies that aimed at inquiring into children's practices of social exclusion in school communities as well as whether and how persuasive technologies can stimulate pro-social behaviors and a sense of empathy among them.

RELATED WORK

Our work on persuasive sociometric technologies shares a number of similarities to an increasing body of work on pervasive games that aim at inducing high levels of physical activity and social interactions among children (see [28], [29]). One of the early examples, Camelot [30] aimed at supporting collaboration and competition among children aged 7-10, through high physical activity and interaction with objects. Swinxbee [31] aims at supporting social interactions among children through sharing an RFID-tagged Frisbee. iGameFloor [32] is an interactive floor platform with bottom projection and camera based tracking of limb contact points for more than 10 users with the goal of supporting social games among collocated children.

While a lot can be learned from this body of work about how technologies can motivate positive social interactions among children, persuasive sociometric technologies are different in scope in that they aim at increasing social interactions through challenging children's perceptions of diversity and confronting themselves with their own practices of excluding others from social activities. As such, persuasive sociometric technologies focus on fostering positive attitudes for social interaction among groups of children, something that is taken for granted in the design of the aforementioned pervasive games.

DRAWING-TELLING STUDY

To inquire into children's notions of diversity and their experiences of social exclusion, we conducted an exploratory study based on the drawing-telling method [14].

Classroom

The study took place in an inclusive primary school in the area of [Removed for Anonymity]. Twenty-five children (10 female) of a third-grade class (*i.e.,* nine-year-old) participated in the study. We chose third-graders due to the increased importance of social development at this age, as they engage in new social roles and are challenged to win social status and acceptance by others [15]. Moreover, this specific class was selected due to its relatively high rate of children at risk of social exclusion. Four of the children were coming from a weak socio-economic background (*i.e.*, one or both parents became unemployed in the past 6 months; according to the teacher, this had an impact in children's lives, such as need for additional free meals at school, inability to have new school equipment and new garments, which in turn was apparent to their classmates), two children were facing learning disorders, and one child had a different ethnic background.

Method

Our interest in this study was, on the one hand, to document friendship networks and capture phenomena of social exclusion, and, on the other hand, to understand how children judge social proximity and social distance between themselves and their classmates. For this purpose, we introduced a probing method based on Wright's drawing-telling technique [14]. Wright proposed this technique as a means towards inquiring into children's felt experiences while maintaining a focus on their own perspectives. It has been used among others in inquiring into children's understanding of environmental sustainability [16], their experiences of music [17] as well their ideas about natural phenomena [18].

The activity took place during a 2-hour long drawing class. Each of the twenty-five children was given an A3 paper depicting outlines of sparse elements such as trees, a

mountain, a river and some flowers (see figure 2). Along with this, each child was given a set of 25 small pieces of paper, each representing a house with the name of each classmate. Children were instructed to create their personal village through positioning their own and their classmates' houses in the landscape, draw any additional decorative elements they wished and color the remainder of the map.

During the drawing activity, informal interviews with the children aimed at an understanding of their rationale when positioning their classmates' houses on the map. We inquired into the factors that contributed towards their judgments of social proximity as well as social distance, and attended to verbal and bodily expressions that could possibly indicate feelings of loneliness and social exclusion, for instance long periods of pause when asked about close friends. The interviews were conducted by a psychologist, were video-recorded and audio-transcribed.

Figure 2. Example drawing by a child.

Findings

The interviews revealed frequent phenomena of stereotyping and peer rejection in children's social interactions. When asked about the reasons for placing the houses of other children close to themselves, children most often reported shared interests within and beyond school activities, participation in group networks and similarity in behavior and physical characteristics. However, when asked about classmates placed at a greater distance, children's justifications ranged from learning difficulties *(e.g., "I really don't know how to say it, he is a little slow most of the times")*, to gender, skin color, aggressive behavior, lack of social skills (*e.g., "She spends more time alone, nobody plays with her"*), and being part of a different group *(e.g., "He never plays with us, he is always apart from us. I don't know why, I never asked him why he does that")*. Socially excluded children would often seek friends in different classrooms, often of younger age, which in turn would isolate them more from their own classroom *(e.g., "I just know he plays a lot with the 1st year kids")*.

Overall, our findings revealed that social exclusion is strongly present in this age group and that this is not limited to children with lack of social skills. Rather, social exclusion is rooted in children's negative stereotyping. Research has however shown that children's stereotyping is not static [19] and can be challenged through increased contact with members of 'out-groups' under positive conditions [20]. Our next study aims at examining the motivational power of technology in initiating and establishing social interactions with members of 'out-groups'.

WIZARD OF OZ STUDY

Our second study aimed at inquiring into the social implications of persuasive socio-metric technologies. Specifically, through a Wizard-of-Oz approach [38] we implemented and studied two principles: *positive reinforcement* and *reciprocity*.

The questions we raised were: a) Can such persuasive strategies affect children's perceptions about others and the way they include or exclude others from their social groups? b) Are there potential negative implications in the social structure of the classroom? c) Can such technologies affect the way children experience social participation in school and their feelings of loneliness?

Classroom

The study involved the same classroom as our drawing-telling study. Having a rich understanding of the social interactions of this group of children made us sensitive to any changes taking place as a result of our intervention. We considered potential carry-over effects between the two studies, however, we judged that these were minimal due to the different nature and the time distance (approx. 4 weeks) of the two studies.

Study design

Children (N=25) were divided into two groups: the motivational feedback (N=13) and the no-feedback (control) group (N=12). In allocating children to one of the two groups, we followed two criteria: (a) children that were most often ranked as least-liked by other children using the Peer Nomination Inventory [21] were equally spread across the two groups, and (b) least-liked pairs (*i.e.*, XY pair when either X rated Y as least-liked, or reversely) were maximized within each of the two groups, so that each child would have the opportunity to interact with those he or she ranked as least liked.

The study followed two rounds of children's peer-interviews (I) and motivational feedback (F). Pre-study and post-study measures (M) of peer acceptance and loneliness were elicited (see figure 3).

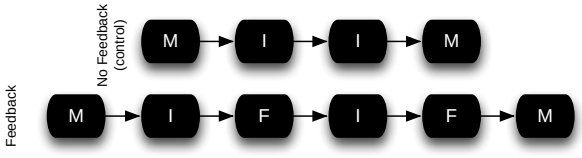

Figure 3. Study procedure for the feedback and the no-feedback condition (M: pre-study and post-study measures of peer-acceptance and loneliness, I: children's peer-interviews session, F: motivational feedback session).

Peer-interview game

A wealth of educational interventions exists for affecting the social structure of classrooms, ranging from environmental arrangements to peer-imitation techniques and teacher-prompting techniques [5]. We chose to use a peer-interviewing game as a means towards motivating children to engage in personally meaningful social interactions. Peer interviewing provided the context for our motivational feedback intervention.

Each round of peer-interviews was constrained to a duration of 20 minutes. In each round, children were given an interview theme with example questions to be used for inspiration (e.g., asking about their dream job, their parent's profession, their family structure, or their summer holiday plans).

Each child was free to select which other child to interview. We did not impose interviewee/interviewer roles as we considered this negotiation process an important part of their social interactions.

Each child received a piece of paper with the names of three other children that they either (a) rated as least-liked using the Peer Nomination Inventory or (b) they had limited interactions with throughout the school year, based on the teacher's observations. We instructed them that these children are their 'lucky charms' in the game that came out of a lottery; interviewing these children would give them extra points.

Motivational feedback

At the end of each peer-interview session, the feedback was presented using a projection on the wall (see figure 4). The feedback consisted of a series of 13 screens, each being displayed for 2 minutes and reflecting the performance of each of the 13 children in the group. We used this type of technology-assisted feedback as a means to visualize their social performance in an appealing and entertaining way that would attract their interest. This feedback was expected to assist them in reflecting on their performance and motivate them to further engage in empathic dialogues with each other.

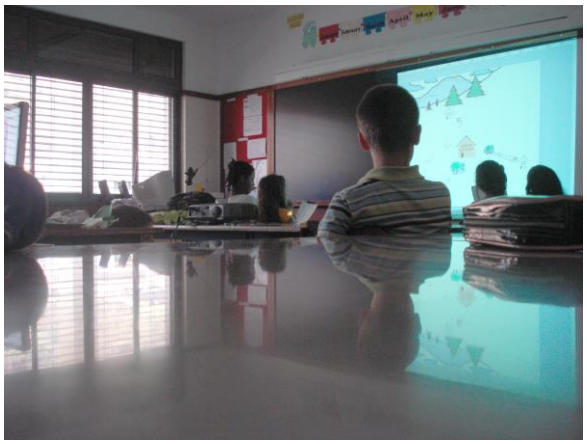

Figure 4. During the motivational feedback session, a series of 13 screens were projected on the wall, each reflecting the performance of each of the 13 children.

Each screen depicted the 'neighborhood' of each of the 13 children, following a similar metaphor to the one employed in our first study. Initially, the screen consisted of a sparse village landscape with elements like a mountain, some forest trees and stones as well as a house in the center of the screen, representing the child. Over the two minutes of each screen's display, additional elements would be added by the Wizard, reflecting the performance of each child in the peer-interviews. This followed two main principles:

Positive reinforcement, a principle used in operant conditioning, one of the most dominant learning theories [22], implies that people change their behaviors through experiencing their consequences. More specifically, it suggests that when an action leads to desirable consequences, it will tend to be repeated. Our goal was to map children's performance in peer-interviews to the visual aesthetics of their screen. For this, we followed two principles. First, for each peer-interview a child had conducted, she/ he would be able to select one graphic element (see figure 5), position it on the screen and color it through instructing the Wizard. The elements ranged from trees, flowers and birds to airplanes, bicycles and cars so that they appeal both to boys and girls but also provide some level of autonomy to each child when shaping up her screen. Second, for peer-interviews that were directed to 'lucky charms' or for peer-interviews that were ranked as high quality by the teacher, children were instructed that they were able to select two elements.

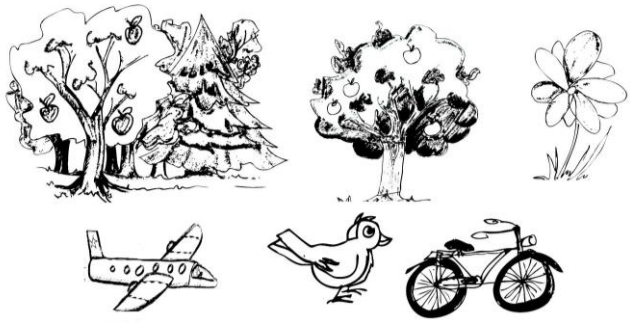

Figure 5. Children's performance during the peer-interview sessions was mapped to visual aesthetics. For each peer-interview they conducted, they could select one of the graphic elements, position it and color it through instructing the Wizard.

Reciprocity, a social norm observed and postulated by [23], broadly suggests that "(1) people should help those who have helped them, and (2) people should not injure those who have helped them" [23]. Educational approaches that leverage on reciprocity have been found to have positive effect in encouraging prosocial behaviors in primary schools [24]. Our goal was to understand whether the public displaying of one-way actions leads to acts of reciprocation. In other words, if child A performed a peer-interview of child B and this was displayed to the class, would child B be inclined to return the favor? We operationalized this in

the following way: Assuming child A has interviewed child B, an element representing a house with the name of child B would be included in the screen of Child A and a directional link (visualized as a stone path) would be created between the two houses, from child A to child B (see figure 6). In the case of a reciprocal interaction (*i.e.*, child B had also interviewed child A), an aesthetic element would be added to the screen (*i.e.*, a line of grass and flowers along the stone path, see figure 6).

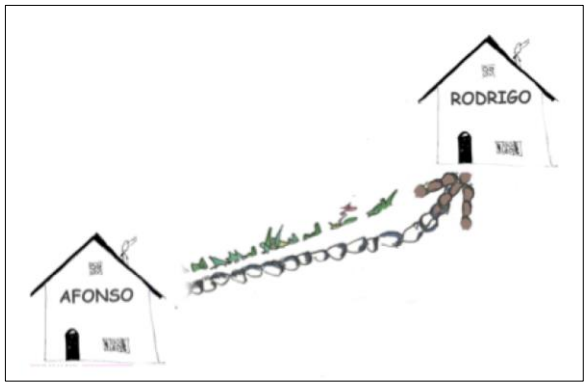

Figure 6. A reciprocal interaction between two children. The stone path reflects that Afonso conducted a peer-interview with Rodrigo. The line of grass along the stone path reflects that Rodrigo returned the favor by conducting a peer-interview with Afonso.

Measures

Behavioral

For each peer-interview session we logged a) the number of peer-interviews a child had conducted, b) the children that these interviews were directed at, c) whether these children were 'lucky charms' for the interviewer and d) the quality of each peer-interview. For judging the quality of peer-interviews we resorted to the teacher's exposure and close connection to children. Once a child would complete a peer-interview, she would summarize the findings to the teacher and deliver to an A5 paper her insights. The teacher was instructed to rate the quality of each peer-interview on a three-point scale, broadly following two main criteria: a) *richness* of content as indicated by the number and depth of learning entities and b) the extent of *empathic understanding* that the child gained during the interview.

Peer-Nomination Inventory

Measures of social participation were elicited at the start and the end of the session using Luftig's and Nichols' Peer Nomination Inventory (PNI) [21]. PNI consists of six questions in which students nominate classmates "with whom they wish to interact in a variety of social situations or which they like 'best' and like 'least' in the class" [21] (see Table 1). All PNI questions were translated to Portuguese and back-translated to English by two researchers, both native in Portuguese and fluent in English, and deviations observed in the back-translated questions were spotted and resolved by an extended research team.

Table 1. The Peer Nomination Inventory [21] was employed at the start and the end of the session.

1.	Name up to three students in the class that you like the most.
2.	Name up to three students in your class you like the least.
3.	Name up to three students in your class that you would like to invite to a party.
4.	Name up to three students in your class you would like to eat lunch with.
5.	Name up to three students in your class you would like to have over to your house after school.
6.	Name up to three students in your class you would like to be your class friend.

Loneliness

Measures of children's loneliness were elicited at the start and the end of the session using the Illinois Loneliness and Social Dissatisfaction Questionnaire [25]. This consists of 16 questions measuring a uni-dimensional latent construct of loneliness and social dissatisfaction as well as eight filler questions focusing on children's hobbies and other activities, "to help children feel more open and relaxed" [25]. All questions were translated to Portuguese using the same back-translation process that was employed in the peer nomination inventory.

Interviews. Post-study interviews aimed at a qualitative inquiry into children's experiences with the peer-interview game, what they learned about their classmates' lives and what they thought about them, as well as how they experienced the interviewee role.

Findings

Children's behaviors

The first question we asked was: did our motivational feedback affect children's behavior? Figure 5 presents the *quality* (as coded by the teacher) and *number* of children's peer interviews for the two rounds of the game.

Interestingly, significant differences are found in the quality and number of peer interviews between the two groups, even in the first round, where no motivational feedback was yet displayed. Children in the feedback group conducted fewer interviews than those in the control condition, $t(23)=2.7$, $p<0.05$, yet of higher quality, $t(22)=2.9$, $p<0.01$). Important to note is that during our instructions to the children we emphasized the importance of gaining new insights (*i.e.*, the quality of the interview). Instructions between the two groups varied only in the description of the process; children in the feedback group were instructed that after each round of peer-interviews, a visualization of their performance would be displayed to the full group. It, thus, appears, that simply knowing that their behaviors would become visible to the full group affected their behavior. We believe that the decrease in the number of interviews was an effect of children's focus for gaining depth with each of the peers they interviewed.

Following the motivational feedback session, in the second round of peer-interviews, children in the feedback condition displayed a significant increase both in the quality, $t(23)=2.7$, $p<0.05$, as well as the number, $t(23)=2.7$, $p<0.05$, of conducted peer-interviews.

Our observations and interviews with children revealed that the visual feedback acted as a strong extrinsic motivation for them. Once they understood that interviewing 'lucky charms' would give them double the points, they developed strategies for increasing the number and length of contact with them:

"[c3] I interviewed S., E. and S. [her 'lucky charms'] twice and I got 12 points for my village!"; "[c17] I looked to the paper I had and went to talk to them. I wanted to get more points".

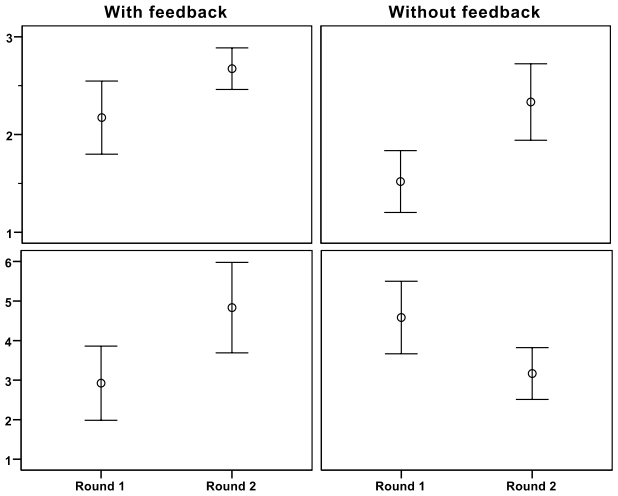

Figure 7. *Quality* and *number* (as coded by the teacher) of children's peer interviews for the two rounds of the game. The motivational feedback intervention took place after the end of each round of peer interviews.

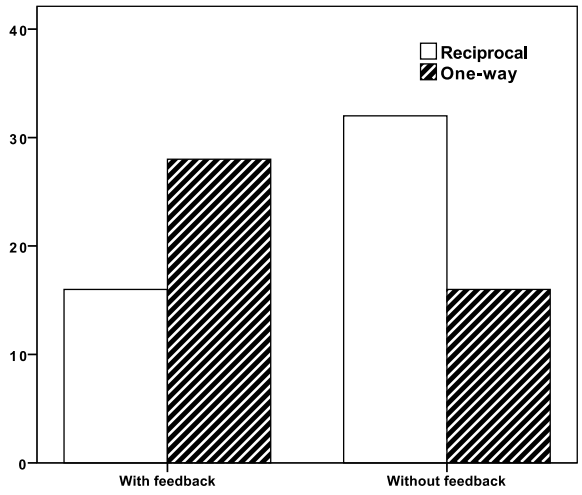

Figure 8. Number of reciprocal versus one-way interviews during the second round of the peer-interview session.

Over time, however, we noticed that children increasingly gained an intrinsic interest in the interview process and the insights they gained from it, and developed strategies that satisfied their curiosity rather the principles of the game:

"[c19] I chose the ones that I don't talk that much"; "[c5] I liked to hear about their dream job, what they wanted to be when they grow up. The teacher asked us in the second grade about this, but that was a long time ago".

On the contrary, children in the without-feedback condition displayed a significant increase in the quality $t(23)=2.7$, $p<0.05$, but a significant decrease in the number of conducted interviews, $t(23)=2.7$, $p<0.05$.

While *positive reinforcement* had results in the direction of what we expected, visual feedback on *reciprocity* displayed results contrary to what we expected. Figure 8 displays the number of reciprocal versus one-way peer-interviews that took place in the with-feedback and the without-feedback conditions. Children in the with-feedback condition, contrary to our expectations, conducted fewer reciprocal interviews than those in the without-feedback condition, $\chi^2(1)=8.5$, $p<0.01$.

We believe that this was due to a conflict between positive reinforcement and reciprocity feedback. As children in the with-feedback condition had a higher incentive to establish contact with their 'lucky charms', they were less willing to reciprocate on contacts they received from others. However, the results also suggest that reciprocity is a naturally occurring phenomenon in children's social interactions.

Interestingly, our observations and interviews with children revealed that they did not only exhibit *retroactive* reciprocal behaviors, but also *proactive*, e.g.,*"[c5] I interviewed B… I also wanted her to interview me".* Through their role as an interviewer and the questions they asked, they often attempted to foster a positive image to others, e.g.,*"[c17] I preferred talking to T. ['lucky charm'] because he was nice to me. I will play with him more often", "[c10] I liked talking more to A. because I liked the questions he made to me".*

Perception of others

In the course of the peer-interviews, children gained new and often surprising insights about each other, e.g., *"[c19] I was impressed about his parents' job. His father and mother are both pastry cooks"*, and uncovered common interests that so far they were not aware of, e.g., *"[c4] T. really likes his pet, his cat. I liked to talk more to T. because of his pet, his cat".*

In other cases we noticed children reflecting over positive qualities of their interview partners, e.g., *"[c2] He can answer the questions. He is smart",* or even feeling part of the improvement of the verbal skills of a child with learning disabilities, e.g., *"[c2] She is better at answering questions.*

When we ask her something, she answers, she is getting better at that. And she is more friendly".

Often, children were willing to share personal stories such as their parents' recent unemployment, or the loss of a close family member. Sharing such personal stories generated a sense of empathy, e.g., *"[c11] I liked to hear about the family. I didn't remember A.'s father had died".* Interestingly, we observed cases where children would attempt to defend and rationalize unfortunate events in the lives of other children that they had previously rated as least-liked, e.g., *"[c3] His father is unemployed, but that is part of this thing called crisis".*

Overall, during the post-study interviews, children often remarked a change in their perception of the children they interviewed and in their willingness to establish contact with them in the future, e.g., *"[c3] I didn't play that much with S. before. I liked talking to her, I will play more often with her", "[c13] I don't remember what I learned from A. But I can say he is nice".*

Figure 9 displays the number of children rated as least-liked using the peer nomination inventory before the study, and, out of them, the number of children that were still rated as least-liked after the study. Children in the with-feedback condition (N=13) provided a total of 39 least-liked nominations (i.e., each child could nominate up to three other children). At the end of the study, 19 of the 39 nominations were removed, indicating a change in the perception of about half of the least liked nominations (48% decrease, $\chi^2(1)=25.1$, $p<0.01$). Children in the without-feedback condition (N=12) provided a total of 35 least-liked nominations. At the end of the study, 11 of the 35 nominations were removed (31% decrease, $\chi^2(1)=13.0$, $p<0.01$). A marginally significant difference was observed between the two conditions ($\chi^2(1)=2.3$, $p=0.07$).

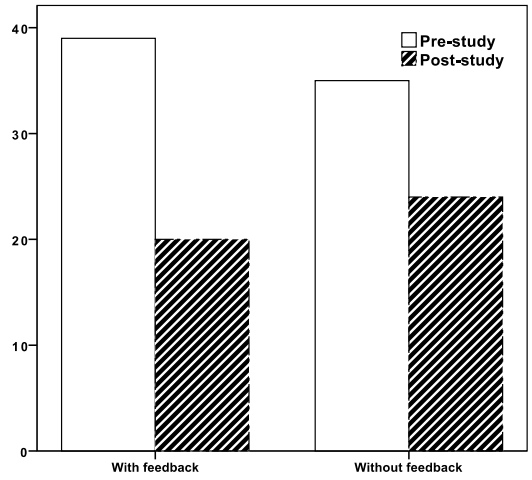

Figure 9. Number of children rated as least-liked using the PNI inventory before the study, and, out of them, number of children that were still rated as least-liked after the study.

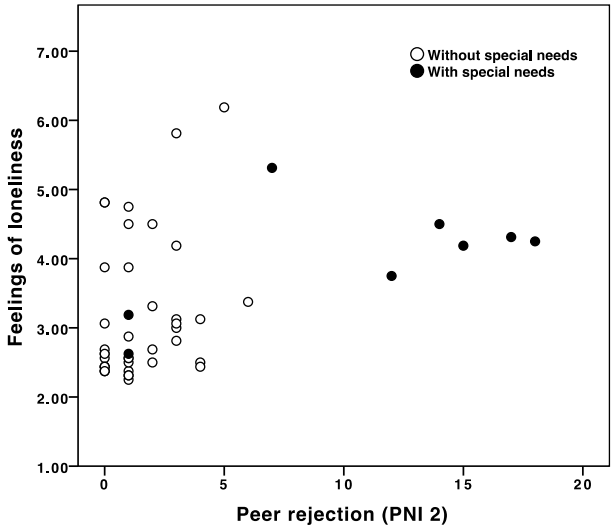

Figure 10. Scatter plot of children's ratings on feelings of loneliness against peer rejection (i.e., number of times rated as least-liked using the Peer Nomination Inventory).

Children's feelings of loneliness

One of the reasons for the success of the peer-interview game was that it changed the social dynamics of the class: children that would otherwise be unpopular and isolated became the focus of attention for many of the children in the class, e.g., *"[c15] S. was always being interviewed by others, she was always busy. I tried but she was not available".*

We observed that children preferred different roles in the game, being the interviewer or the interviewee, depending on their social acceptance in the class. Children that a) either stated that they feel alone or were identified by others as lonely during our first study, or b) were more frequently rated as least-liked in the peer nomination inventory, were more likely to enjoy the interviewee role, e.g., *"[c14] I liked when they asked me questions"*. On the contrary, children that were most frequently rated as most-liked by others in the peer nomination inventory, had a tendency to prefer the interviewer role, e.g., *"[c17] I liked to ask the questions, because I am curious", "[c3] I liked to interview my classmates. It was fun. We made a lot of questions"*.

However, both sessions (with and without feedback) resulted to non-significant reduction in feelings of loneliness (with-feedback: *mean difference = -0.28, t(12)=-1.40, p=0.18*, without-feedback: *mean difference = - 0.13, t(11)=-0.85, p=0.41*). Overall, children's feelings of loneliness displayed a strong correlation (Pearson's product moment correlation r=0.4, p<0.01) with peer rejection as measured by one of the scales (i.e., least-liked) of the peer nomination inventory, largely dominated by the peer rejection of children with special educational needs (see figure 10).

DISCUSSION

In this paper we presented two studies that aimed at inquiring into children's practices of social exclusion in

school communities as well as whether and how persuasive technologies can stimulate pro-social behaviors and a sense of empathy among them.

Our first study revealed the social exclusion is prevalent in children's social interactions. Exclusion happened not only as an act of *interpersonal rejection* [26], based upon individual differences in personality characteristics, but also through *intergroup exclusion* [26], as children sought to identify themselves with desirable social groups. Interestingly, we found that social exclusion was not limited to children with lack of social skills, but was rather the result of negative stereotyping among children.

Our second study aimed at establishing the impact of two motivational techniques, namely positive reinforcement and reciprocity, on children pro-social behaviors. The findings strongly supported our initial expectations. Positive reinforcement had a strong impact on the number and quality of peer-interviews conducted by children, suggesting that children are willing to engage in new roles and adopt pro-social behaviors given sufficient incentives.

While children's pro-social behaviors were initially driven by the game mechanisms, we noticed that children increasingly gained an intrinsic interest in the peer-interview process. Moreover, peer-interviews often lead to uncovering unexpected insights about their peers, and fostering a sense of empathy among them. These results provide confidence for persuasive sociometric technologies in two ways. First, they corroborate prior work suggesting that while children are prone to negative stereotyping, these stereotypes are not stable [19], and can be challenged through increased contact between them under positive conditions [20]. Second, they suggest that game mechanisms such as the ones employed may, over time, lead to intrinsically motivated pro-social behaviors, thus increasing the likelihood of sustained impact on the long run [33]. Both our observations and children's interview statements suggest that children were captivated by the innovative element of creating their personal space with the assistance of a Wizard, which we believe further reinforced their interest in engaging in peer-interviews.

However, even in the constrained experimental setting of our second study, the complexity of social behavior became apparent. First, we observed that, simply knowing that their behaviors will become visible to the full group affected children's behavior even in the first round of interviews, when no motivational feedback was presented yet. While this is supported from theory, in that mutual awareness results to increased accountability in adults' behaviors [27], we have limited understanding of the social norms that frame such self-disclosure events in childhood. Second, we found the two types of motivational feedback, based on positive reinforcement and reciprocity, to conflict when overt behaviors were concerned, resulting to findings contrary to our expectations regarding the impact of reciprocity on children's pro-social behaviors. Yet, reciprocal behaviors were observed among children leading us to believe the reciprocity is a naturally occurring phenomenon in school environments. We believe that further research is needed to establish the impact of reciprocity as a motivational technique in sociometric technologies.

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