



UvA-DARE (Digital Academic Repository)

Susceptibility to peer influence on prosocial behavior in adolescents with Mild Intellectual Disability or Borderline Intellectual Functioning

Wagemaker, E.; van Hoorn, J.; Bexkens, A.

DOI

[10.1016/j.ridd.2021.104143](https://doi.org/10.1016/j.ridd.2021.104143)

Publication date

2022

Document Version

Final published version

Published in

Research in Developmental Disabilities

License

CC BY

[Link to publication](#)

Citation for published version (APA):

Wagemaker, E., van Hoorn, J., & Bexkens, A. (2022). Susceptibility to peer influence on prosocial behavior in adolescents with Mild Intellectual Disability or Borderline Intellectual Functioning. *Research in Developmental Disabilities, 120*, [104143]. <https://doi.org/10.1016/j.ridd.2021.104143>

General rights

It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations

If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: <https://uba.uva.nl/en/contact>, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.

UvA-DARE is a service provided by the library of the University of Amsterdam (<https://dare.uva.nl>)



ELSEVIER

Contents lists available at ScienceDirect

Research in Developmental Disabilities

journal homepage: www.elsevier.com/locate/redevdis

Susceptibility to peer influence on prosocial behavior in adolescents with Mild Intellectual Disability or Borderline Intellectual Functioning

Eline Wagemaker^{a,b,*}, Jorien van Hoorn^{c,d}, Anika Bexkens^{c,e}^a University of Amsterdam, Department of Psychology, Nieuwe Achtergracht 129B, 1018 WS, Amsterdam, the Netherlands^b Research Priority Area Yield, University of Amsterdam, Nieuwe Achtergracht 129B, 1018 WS, Amsterdam, the Netherlands^c Leiden University, Department of Psychology, Developmental and Educational Psychology, Wassenaarseweg 52, 2333 AK, Leiden, the Netherlands^d Level, Academic Center of Child- and Adolescent Psychiatry, Fred. Roeskestraat 73, 1076 EC, Amsterdam, the Netherlands^e GGZ Delfland, Department of Child and Adolescent Psychiatry, de Laat de Kanterstraat 32, 2313 JV, Leiden, the Netherlands

ARTICLE INFO

No. of reviews completed is 2

Keywords:

Peer influence
 Prosocial behavior
 Mild Intellectual Disability
 Borderline Intellectual Functioning
 Adolescence

ABSTRACT

Background: Adolescents with Mild Intellectual Disability (MID) or Borderline Intellectual Functioning (BIF) are highly susceptible to negative peer influence. However, research in typically developing adolescents shows that peers can also promote prosocial behavior, which is an opportunity for positive development.

Aims: The current study aimed to investigate the effect of peer influence on prosocial behavior in adolescents with MID or BIF.

Methods and procedures: In an experimental donation task, 40 adolescents with MID or BIF ($M_{age} = 14.0$, 40 % boys) were repeatedly asked how many of five coins they would like to donate to the group. The task had four consecutive within-subject conditions: alone, with virtual peers present, with virtual peer feedback, and alone again.

Outcomes and results: Results showed that adolescents made larger donations with virtual peers present, and even larger with peer feedback. This increase in donations sustained for subsequent decisions made alone. Finally, adolescents with BIF made larger donations with peer feedback compared to adolescents with MID.

Conclusions and implications: Adolescents with MID or BIF are susceptible to peer influence on prosocial behavior, demonstrating the potential effect social context can have on promoting positive development.

What this paper adds?

While it has been established that adolescents with MID or BIF are susceptible to negative peer influence, this study was the first to investigate whether this is also the case for peer influence on prosocial behavior. We demonstrated that both the presence and positive feedback of peers can promote prosocial behavior in an experimental setting. This adds to the current literature that adolescents with MID or BIF are not only outer-directed to explicit feedback from peers, but that also implicit social mechanisms may play a role.

* Corresponding author at: University of Amsterdam, Department of Psychology, Nieuwe Achtergracht 129b, 1018 WS, Amsterdam, the Netherlands.

E-mail address: E.Wagemaker@uva.nl (E. Wagemaker).

<https://doi.org/10.1016/j.ridd.2021.104143>

Received 14 July 2021; Received in revised form 26 November 2021; Accepted 30 November 2021

Available online 4 December 2021

0891-4222/© 2021 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license

(<http://creativecommons.org/licenses/by/4.0/>).

Adolescents did not decrease their prosocial behavior after peers were no longer present indicating a carryover effect. Moreover, our study provides hints for some individual differences in susceptibility to peer influence on prosocial behavior. The positive effect of peer feedback on prosocial behavior was stronger for adolescents with BIF compared to adolescents with MID. This heterogeneity in the combined MID/BIF group suggests that future research should focus on potential differences between these groups. Finally, we related the task performance to self-reports of resistance to peer influence and experience of social rewards as well as to parent and teacher reports of prosocial behavior and peer problems. The peer feedback and carryover effects were related to more enjoyment of prosocial interactions and sociability, and fewer peer problems. When our findings are replicated, susceptibility to peer influence can be seen as not only a risk factor for adolescents with MID or BIF, but also as a protective factor in prosocial contexts.

1. Introduction

Adolescents with mild intellectual disability (MID; $IQ < 70$ and mild limitations in adaptive functioning) and adolescents with borderline intellectual functioning (BIF; $70 < IQ < 85$) are highly susceptible to negative influences from their peers (American Psychiatric Association, 2013; Wieland & Zitman, 2016). Intellectual disability is characterized by lower risk-awareness in social situations (Greenspan et al., 2011), and vignette studies suggest that adolescents with MID or BIF struggle to make safe decisions under peer influence (Khemka et al., 2009). Moreover, experimental studies demonstrate that adolescents with MID or BIF show more risk taking under peer influence than typically developing adolescents (Bexkens et al., 2019; Wagemaker et al., 2020). These studies demonstrate the power of peer influence on risk-taking behaviors in adolescents with MID or BIF, which can lead to negative outcomes. However, high susceptibility to peer influence could also help adolescents to foster positive outcomes (see e.g., Telzer et al., 2018). Therefore, the current study investigates whether peer influence can promote prosocial behavior in adolescents with MID or BIF.

1.1. Susceptibility to peer influence on prosocial behavior in typically developing adolescents

We define prosocial behavior as voluntary actions intended to benefit another, which range from cooperating with others to making donations (Do et al., 2017; Eisenberg et al., 2006). Adolescence is characterized by an increasing need to contribute to society as well as to develop prosocial goals (Fulgini, 2019). Demonstrating prosocial behavior is also beneficial for adolescents. For instance, higher prosocial behavior in adolescents has been longitudinally associated with better friendship quality (Son & Padilla-Walker, 2020). Also, prosocial behavior has been linked to higher academic performance (Gerbino et al., 2018), potentially as adolescents who demonstrate prosocial behavior can create a better learning environment because of better relationships with peers and teachers (Jennings & Greenberg, 2009; Wentzel, 1993). Moreover, greater prosocial behavior during adolescence can be protective against negative outcomes. A meta-analysis shows that higher levels of prosocial behavior are associated with lower levels of internalizing and externalizing problems during adolescence (Memmott-Elison et al., 2020). Finally, prosocial behavior can even protect against later negative peer influences on aggressive behavior (Jung & Schröder-Abé, 2019), which may be explained by adolescents with high prosocial behavior also having higher empathy and selecting other prosocial peers.

There is convincing evidence that peers can support adolescents' prosocial behavior. In naturalistic classroom settings, a large longitudinal survey demonstrated that higher collective levels of classmates' prosocial behavior longitudinally predict more prosocial behavior two years later (Busching & Krahe, 2020). Also, several experimental studies using donation games show that positive feedback from virtual peers increases adolescents' prosocial behavior compared when playing the game alone (Chierchia et al., 2020; Choukas-Bradley et al., 2015; Van Hoorn et al., 2017; Van Hoorn, Van Dijk, Güroglu et al., 2016; van Hoorn, Van Dijk, Meuwese et al., 2016). Experimental designs enable the investigation of different underlying peer influence mechanisms. Implicit peer influence can be manipulated by peer presence, where potential increases in prosocial behavior are assumed to be guided by perceived peer norms. Explicit peer influence can be manipulated with explicit peer feedback, where increases in prosocial behavior can be explained by the effect of social reinforcement from peers (for reviews on peer influence mechanisms, see e.g., Brechwald & Prinstein, 2011; Do et al., 2020). The current study also adopts an experimental design to investigate whether adolescents with MID or BIF are susceptible to peer influence on prosocial behavior and which mechanisms could underlie this effect.

1.2. Peer influence on prosocial behavior in adolescents with MID or BIF

Previous research on prosocial behavior suggests that supporting prosocial behavior could be highly relevant for adolescents with MID or BIF. Although little is known about the level of prosocial behavior in these adolescents specifically, studies on children and/or adolescents with an intellectual disability show that both parents and teachers generally report lower levels of prosocial behavior than parents and teachers of typically developing children or adolescents (e.g., Bailey et al., 2019; Elberling et al., 2010; Emerson, 2005; Meltzer et al., 2003). As adolescents with an intellectual disability also have lower quality of peer relations (Tipton et al., 2013), more psychopathology (Emerson & Hatton, 2007), and worse academic performance than typically developing adolescents, these adolescents could benefit from the above-mentioned effects of participating in more prosocial behavior (Gerbino et al., 2018; Memmott-Elison et al., 2020; Son & Padilla-Walker, 2020). Thus, fostering prosocial behavior can provide adolescents with MID or BIF with broader opportunities for positive development.

A potential port-of-entry for increasing prosocial behavior could be learning from peers. Similar to the studies in typically developing adolescents, peer influences could support prosocial behavior of adolescents with MID or BIF. To our knowledge, thus far no studies on susceptibility to peer influence on prosocial behavior in adolescents with MID or BIF have been performed. Also in general, the number of studies on susceptibility to peer influence in adolescents with MID or BIF is limited. Most studies focus on peer

influence on risk-taking or problem behavior in adolescents with MID or BIF. A vignette study showed that adolescents with an intellectual disability make less safe decisions in vignettes that contained social coercion (Khemka et al., 2009). Also, two experimental studies show that adolescents with MID or BIF show a steeper increase in risk taking under peer influence than alone relative to typically developing adolescents (Bexkens et al., 2019; Wagemaker et al., 2020). A large ($N = 1125$) longitudinal study in children and adolescents with an intellectual disability in special needs classrooms found no effect of baseline classroom levels of antisocial and disruptive behaviors on individual development of such behaviors over time (Müller et al., 2021). In sum, based on experimental studies there is evidence that adolescents with MID or BIF are highly susceptible to the direct effects of peer influence on risk taking. However, longer term peer socialization effects on problem behavior are not yet found.

There are a few studies providing evidence that susceptibility to peer influence may not be limited to risk-taking behaviors. Adolescents with a lower IQ report less resistance to peer influence in general than adolescents with a higher IQ (Dekkers et al., 2017; Steinberg & Monahan, 2007). Moreover, in an experimental study on social judgements, adolescents with an intellectual disability were more influenced by their peers' opinions than typically developing adolescents (Egger et al., 2021). However, they were also more influenced by non-social stimuli (i.e., a blinking light on the rating scale) compared to typically developing adolescents. Thus, this study demonstrates that several mechanisms can play a role in susceptibility to peer influence for adolescents with MID or BIF. The general tendency to change behavior in the presence of social and non-social cues could be related to outer-directedness of individuals with an intellectual disability (Tanaka et al., 2001), while the effect of peers could also be guided by implicitly perceived peer norms.

A first hint for susceptibility to peer influence on prosocial behavior in adolescents with MID or BIF can be found in the longitudinal study of Busching and Krahe (2020). This study demonstrated that especially for adolescents from lower academic tracks (including vocational tracks), higher collective levels of classmates' prosocial behavior predict more prosocial behavior. As adolescents with MID or BIF often follow vocational education (see e.g., Bexkens et al., 2019; Wagemaker et al., 2020), this may suggest that adolescents with MID or BIF are indeed susceptible to peer influence on prosocial behavior. Thus, in the same way that peer influence may increase dangerous risk-taking behavior in adolescents with MID or BIF, we hypothesize that peers could also promote prosocial behavior.

1.3. Differences between adolescents with MID and adolescents with BIF

Adolescents with MID or BIF are often analysed as one group in the Netherlands (i.e., mild-to-borderline intellectual disability; MBID, see e.g., De Beer, 2016). However, research indicates significant heterogeneity in the combined MBID group (Nouwens et al., 2017). Potentially, adolescents with MID and adolescents with BIF differ in characteristics that may increase their susceptibility to peer influence on prosocial behavior (Contena & Taddei, 2017). Therefore, we expect differential susceptibility to peer influence on prosocial behavior for adolescents with MID and adolescents with BIF. The direction of the expected effect is however unclear. On the one hand, adolescents with MID could be more susceptible than adolescents with BIF. In an experimental study on outer-directedness, individuals with MID were shown to have a higher tendency to change behavior in the presence of external cues compared to individuals with BIF or average IQ (Tanaka et al., 2001). Along these lines, there is a linear association between lower IQ and lower reported resistance to peer influence (Steinberg & Monahan, 2007). On the other hand, adolescents with BIF have higher IQ and better working memory than adolescents with MID (Schuchardt et al., 2010), which may facilitate social learning. Taken together, some progress has been made in elucidating differential characteristics related to susceptibility to peer influence in adolescents with MID or BIF. However, the literature currently provides inconsistent findings regarding the direction of these differences, requiring further research on this important topic. Therefore, we explore similarities and differences between with MID and adolescents with BIF in their susceptibility to peer influence on prosocial behavior.

1.4. Study design and hypotheses

In the current study, we specifically focus on the cooperation aspect of prosocial behavior. We therefore operationalize prosocial behavior as cooperation choices that result in a benefit for the group, but in a loss for the individual (van Hoorn, van Dijk, Meuwese et al., 2016). To provide initial evidence on susceptibility to peer influence on prosocial behavior in adolescents with MID or BIF, we adopt an experimental task using social dilemma. Such approaches are well-known and validated for studying the process of social decision-making (for a review, see Crone et al., 2014). Experimental tasks enable standardization of the peer influence situation, which is highly useful to create the exact same circumstances for each adolescent. We incorporated a within-subjects design with virtual peers in our experimental task. Within-subjects designs fit the population well as individuals with an intellectual disability are known to be a highly heterogeneous group (Emerson, 2005) and therefore difficult to compare with each other. Our study thus enables us to study prosocial behavior under different peer influence circumstances. More specifically, we study the effect of implicit peer norms on prosocial behavior by manipulating the presence of peers that do not provide feedback. On top of this, we can study the effect of explicit social reinforcement on prosocial behavior using encouraging feedback from peers.

Adolescents with MID or BIF played a donation task, the Peers Public Goods Game. During this game, adolescents were repeatedly asked how many of five coins they would like to donate to the group, while keeping the rest for themselves. The game consisted of four types of trials, which were presented in sequential blocks: alone, with virtual peers present, with virtual peers providing positive feedback on prosocial behavior, and alone again. In line with previous research on explicit peer influences related to outer-directedness and social reinforcement in adolescents with an intellectual disability (Bexkens et al., 2019; Egger et al., 2021; Tanaka et al., 2001; Wagemaker et al., 2020), we hypothesize that adolescents with MID or BIF increase their prosocial behavior after receiving positive peer feedback on their prosocial behavior compared to playing alone. Besides, we explore differences in several sets of blocks. First, to obtain information on whether adolescents with MID or BIF are also susceptible to implicit peer influences related to perceived social

norms, we explore whether adolescents with MID or BIF increase their prosocial behavior in response to peer presence compared to when playing alone. Second, to study the additive effect of different peer influences, we explore whether peer feedback can even further increase prosocial behavior as compared to peer presence. Third, as there is initial evidence that typically developing adolescents maintain their increase in prosocial behavior when alone again after the peers have left (Choukas-Bradley et al., 2015; but see Van Hoorn et al., 2017; van Hoorn, Van Dijk, Meuwese et al., 2016), we explore whether adolescents with MID or BIF also demonstrate such a carryover effect.

Furthermore, we administer self-reports on the experience of social rewards, resistance to peer influence, and parent and teacher reports on prosocial behavior and peer problems. We explore differences between adolescents with MID and adolescents with BIF on the experimental task and on these constructs. Finally, we check whether higher susceptibility to peer influence on prosocial behavior on the task can be related to more enjoyment of social rewards, less resistance to peer influence, more prosocial behavior, and less peer problems.

2. Materials and methods

2.1. Participants

We recruited 41 adolescents from practical vocational education in the Netherlands (see Table 1 for descriptive information). This education type is characterized by a focus on practical skills and smaller classes. Admittance criteria for this type of education are: (1) an IQ between 55 and 80, tested no longer than two years prior to admittance; and (2) learning delays of 50 % or more in at least two of the following areas: mathematics, reading accuracy and fluency, reading comprehension, and spelling. All adolescents had been tested with a standardized IQ test (usually Wechsler Intelligence Scale for Children; WISC-V) and had full scale IQ scores included in their school file, except for one adolescent who was therefore excluded from analyses resulting in a sample size of 40. Adolescents with an IQ below 70 were assigned to the MID group and adolescents with an IQ between 70 and 85 were assigned to the BIF group. Five adolescents were reported to have a psychiatric diagnosis: one had Attention Deficit Hyperactivity Disorder (1 BIF), two had Pervasive Developmental Disorder – Not Otherwise Specified (2 MID), and two had both disorders (2 BIF). Three adolescents were reported to use medication (methylphenidate 1 MID, 2 BIF). Both parents and adolescents provided active informed consent.

2.2. Materials

2.2.1. Descriptive measures

Family income was measured by summing up the gross yearly income of both parents based on a 6-point scale ranging from €0 to €10,000 to > €50,000. Parental education was measured by averaging the highest level of education of both parents on a scale from 1

Table 1
Descriptive Information.

	All (N = 40)	MID (N = 21)	BIF (N = 19)	MID vs. BIF
IQ <i>M</i> (<i>SD</i>)	70.77 (6.69)	65.38 (3.20)	76.74 (3.77)	$t(38) = -10.30, p < .001$
IQ range	58–83	58–70	71–83	
Age <i>M</i> (<i>SD</i>)	13.98 (1.17)	14.24 (1.30)	13.68 (.95)	$t(38) = 1.53, p = .14$
Age range	12–17 years	12–17 years	12–15 years	
Sex (% boys)	40 %	28.6 %	52.6 %	$\chi^2(1) = 2.41, p = .12$
Family income ^a				
€0–€10k	17.5 %	23.8 %	10.5 %	
€10k–€20k	17.5 %	19 %	15.8 %	
€20k–€30k	2.5 %	0 %	5.3 %	$\chi^2(6) = 4.52, p = .61$
€30k–€40k	20 %	23.8 %	15.8 %	
€40k–€50k	12.5 %	9.6 %	15.8 %	
> €50k	15 %	14.3 %	15.9 %	
Parental education <i>M</i> (<i>SD</i>) ^b	2.71 (.74)	2.57 (.55)	2.85 (.90)	$t(34) = -1.14, p = .26$
Ethnicity ^c				
Dutch	65 %	78.9 %	61.1 %	
Surinam	7.5 %	5.3 %	11.1 %	$\chi^2(3) = 1.92, p = .59$
Netherlands Antilles	10.0 %	5.3 %	16.7 %	
Other	10.0 %	10.5 %	11.1 %	
Comorbid diagnoses	15 %	14.3 %	15.8 %	$\chi^2(6) = 6.03, p = .42$
SDQ total difficulties				
Parent report ^d <i>M</i> (<i>SD</i>)	25.97 (5.66)	27.32 (6.23)	24.47 (4.69)	$t(34) = 1.53, p = .13$
Teacher report ^e <i>M</i> (<i>SD</i>)	26.31 (4.95)	26.30 (5.65)	26.32 (4.24)	$t(37) = -.01, p = .99$

Abbreviations: BIF Borderline Intellectual Functioning, MID Mild Intellectual Disability, SDQ Strengths and Difficulties Questionnaire.

^a Family income data was missing for six adolescents.

^b Parental education data was missing for four adolescents.

^c Ethnicity of three adolescents was missing.

^d Three parents did not fill out the SDQ (n = 1 MID, n = 2 BIF).

^e One teacher did not fill out the SDQ (n = 1 MID).

to 6 based on the International Standard Classification of Education (UNESCO, 1999). If data from one parent was missing, the data from the remaining parent was used as gross yearly income. Ethnicity was measured by asking for the parents' country of birth and categorized into four categories: Dutch, Surinam, Netherlands Antilles and other.

2.2.2. Peers Public Goods Game

Prosocial behavior was measured by the experimental Peers Public Goods Game (as adapted from Van Hoorn et al., 2017). Adolescents were instructed that they would play an online game with a group of three anonymous age-matched peers. In reality, adolescents played the game individually. On each trial of the game, adolescents were asked to choose how they would like to divide five coins between themselves and the group. All tokens donated to the group were multiplied by two and then divided equally over all players. To measure voluntary behavior, adolescents were instructed that the allocation of coins over the group and the individual was not shown to the other group members. Adolescents could also not see the choices made by virtual group members to further ensure independent decisions. Whereas on the individual level, the optimal strategy is to donate nothing to the public goods pot, on the collective level the group would earn most if all members would donate all of their tokens (Harbaugh & Krause, 2000). More specifically, with donations being multiplied by two and then divided equally over four players, the individual's net return of donating one token is negative (i.e., -.5 token). Thus, as egoistic motives cannot explain donations, contributions to the public goods pot are viewed as intended to benefit others (Do et al., 2017; Penner et al., 2005). The amount of coins donated to the public goods pot was used as an indicator of prosocial behavior.

Adolescents played 30 trials in four different conditions (see Fig. 1). First, adolescents played five Solo trials (Solo1 condition, trial 1–5) during which decisions were made individually as described above. Second, adolescents were informed that a group of five age-matched peers would be spectators during the next ten trials (Spectator condition, trial 6–15). Peers were not actually present but were simulated in the task by showing pictures of peers. These pictures were selected from a database of morphed adolescent faces and did therefore not represent existing adolescents (see Van Hoorn et al., 2017 for a detailed description). Adolescents were informed that the spectators would evaluate their on-task choices, but feedback was blurred and therefore not recognizable to the adolescent. The trial screens were similar to the Solo condition, with the addition of a feedback screen showing pictures of peers and blurred feedback. Third, after this block adolescents were informed that on the next ten trials a different group of five age-matched peers would be present, who would now also provide feedback on adolescents' choices (Feedback condition, trial 16–25). In this condition the

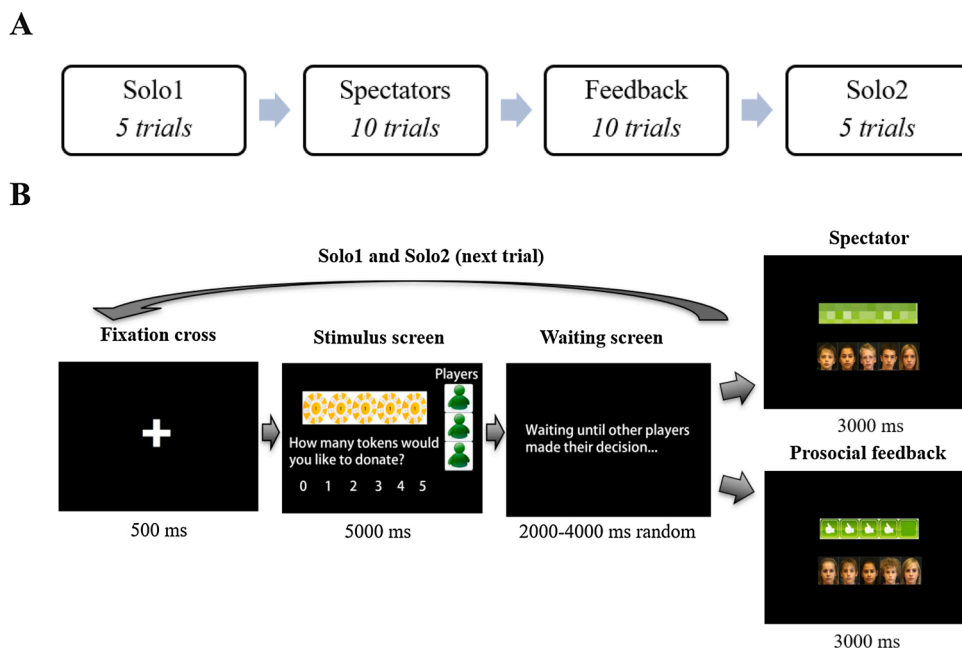


Fig. 1. Illustration of the Peers Public Goods Game.

A Adolescents played three types of conditions in the game: Solo, only with donations to group; Spectators, with (virtual) peers present on pictures who would evaluate adolescents' decisions, but blurred feedback; Feedback, with peers present on pictures who would provide prosocial feedback with 'likes'. After the Feedback condition, they played another Solo condition (i.e., Solo2).

B Illustration of order of screens during the game. On each trial, the adolescent made an independent decision within their group about the allocation of five tokens between themselves and the group. The group consisted of three virtual age-matched peers, displayed in green to guarantee anonymity. In the Solo1 and Solo2 conditions, adolescents proceeded to the next trial after the waiting screen. In the Spectators condition, a spectator screen followed the waiting screen. Five (virtual) peers were able to see the decisions of the group and would evaluate these decisions, but their feedback was blurred. In the Feedback condition, a feedback screen followed the waiting screen. Five different (virtual) peers provided feedback with 'likes' or thumbs up. In this case, four out of five spectators liked the adolescent's decision. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

feedback screen included both pictures of peers and feedback using thumbs up (i.e., likes) for a valued decision or no thumbs up for a disliked decision. The game was programmed to show likes when adolescents chose to donate more than one token to the public goods pot. Likes increased with donated tokens in such a way that adolescents received two thumbs up for two tokens, four thumbs up for three tokens, and five thumbs up for four and five tokens. Finally, adolescents were informed that peers went offline again, and they would now play another five trials of the game unobserved (Solo2 condition, trials 26–30). These trials were identical to the first five trials in the Solo1 condition. After the game, adolescents filled out several exit questions. We report the answers on three open questions regarding their motives for donating behavior.

2.2.3. Adolescent Social Reward Questionnaire (SRQ-A)

To assess the experience of social rewards we used the Dutch 20-item SRQ-A (Altikulac et al., 2019). This self-report questionnaire consists of five subscales: Admiration, Negative Social Potency, Passivity Prosocial Interactions, and Sociability. No total scores can be computed. Psychometric properties of the SRQ-A were shown to be adequate in typically developing adolescents (Altikulac et al., 2019). In the current sample, the reliability was low for two subscales (Admiration $\alpha = .48$; Negative Social Potency $\alpha = .34$) but adequate to good for the other three subscales (Passivity $\alpha = .63$, Prosocial Interactions $\alpha = .77$, Sociability $\alpha = .70$). Therefore, we decided to only analyse the Passivity, Prosocial Interactions and Sociability subscales.

2.2.4. Resistance to Peer Influence Questionnaire (RPI)

To assess resistance to peer influence we used the Dutch 10-item RPI (Steinberg & Monahan, 2007; Sumter et al., 2009). In the RPI, adolescents were first asked to choose the option that best described the group of people (i.e., more vs. less peer resistant) they belonged to. Then, they were asked to indicate to what degree they felt they belonged to this group (i.e. “Really true” or “Sort of true”). Scores on each item were aggregated in a 4-point Likert-type scale score, in which the “Really true” and “Sort of true” options of the less peer-resistant statement were coded as 1 and 2 respectively, and the “Sort of true” and “Really true” options of the more peer-resistant statement were coded as 3 and 4 respectively. An example item is: *Some children go along with their friends just to keep their friends happy BUT Other children refuse to go along with what their friends want to do, even though they know it will make their friends unhappy.* The dependent variable was the total sum score of all items. Previous studies provide evidence for both good reliability (α 's $> .70$; Steinberg and Monahan, 2007; Sumter et al., 2009) and validity (Steinberg & Monahan, 2007). In our sample, reliability was sufficient ($\alpha = .62$). The RPI has successfully been used in adolescents with MID and BIF before (Dekkers et al., 2017).

2.2.5. Strengths and Difficulties Questionnaire (SDQ) - parent and teacher report

We administered parallel SDQ versions for parents and teachers (Goodman et al., 2000). The SDQ is a 25-item screener for psychopathology that consists of five subscales. In the present study, we used the total problem score (sum score of Hyperactivity, Emotional Symptoms and Conduct Problems) to compare the two groups (see Table 1) and the total scores on the Peer Problems and Prosocial Behavior subscales as indicators of sociability and prosocial behavior. The SDQ is valid and reliable in typically developing adolescents (Becker et al., 2015; Theunissen et al., 2019; Vugteveen et al., 2019). In our sample, reliability of the Peer Problems and Prosocial Behavior subscales was sufficient to good (parent report Peer Problems $\alpha = .71$; Prosocial Behavior $\alpha = .57$; teacher report Peer Problems $\alpha = .69$; Prosocial behavior $\alpha = .78$).

2.3. Procedure

Adolescents were tested individually at school in an empty classroom. After providing consent, they played the Peers Public Goods Game. Before starting the game, adolescents received extensive offline step-by-step instructions. Poker chips were used to simulate practice trials. Adolescents were shown how donated tokens would be multiplied by two and subsequently be equally divided over all the players. When adolescents understood the dynamics of the task based on this offline simulation, the computer task was started. During three online practice trials, adolescents were given step-by-step instructions. After these practice trials, adolescents started with a short quiz on their task comprehension. If necessary, instructions were repeated. There was no significant correlation between number of correctly answered quiz questions and task performance in the different conditions (all p 's $> .10$). After the task, adolescents filled out some exit questions, the SRQ-A and RPI in Qualtrics. Based on exit question answers, there were no signs of disbeliefs of the peer manipulation. There was an experimenter in the room at all times to answer questions. Additional instructions were standardized by using standard answers to frequently asked questions. After participation, a research assistant provided a debriefing in the classroom about the goals of the study. Parents and teachers were asked to fill out the online SDQ. In addition, parents reported on their family income, education level, and ethnicity. All procedures were performed in compliance with relevant laws and institutional guidelines and approval was obtained from the local institutional ethics committee.

2.4. Analyses

As main analysis we performed a mixed ANOVA with Condition (Solo1, Spectator, Feedback, Solo2) as repeated measures factor, Group (MID and BIF) as between factor, and the number of donated coins in the Peers Public Goods Game as dependent variable. To follow-up the main effect of Condition, we performed contrasts. We expected an increase in donations from the Solo1 condition to the Peer Feedback condition in both groups. Moreover, we explored the differences in donations from the Solo1 to the Spectator condition, from the Spectator to the Feedback condition, from Feedback condition to the Solo2 condition, and from the Solo1 to the Solo2 condition. We calculated partial eta squared effect sizes (denoted by η_p^2), which can be interpreted as small ($\eta_p^2 = .01$), medium (η_p^2

= .06) or large ($\eta_p^2 = .14$; Cohen, 2013). To follow-up the Condition \times Group interaction, we performed four independent t -tests on difference scores of the above-mentioned pairs of conditions. We used Bonferroni corrections to correct for multiple comparisons, corrected p -values will be denoted by p^B . We used Cohen's d effect sizes for the follow-up tests, which can be interpreted as small ($d = .2$), medium ($d = .5$) or large ($d = .8$; Cohen, 1988). An a-priori power-analysis showed that 24 participants were sufficient to detect medium within \times between interaction effects ($f = .25$) with $\alpha = .05$ and repeated measurement r 's = .5. To compare the groups on SRQ-A subscales, RPI, and the SDQ Peer Problems and Prosocial subscales, we used independent t -tests. To relate these questionnaires to task scores, we first calculated difference scores between the Solo1 condition and the Feedback condition as well as between all consecutive conditions, and then performed Pearson correlations. All analyses were performed in SPSS.

3. Results

3.1. Preliminary analyses

When checking for outliers, there were no scores that deviated more than three SD 's from the mean. Also, adolescents with MID and BIF did not differ in their reaction times in the task conditions (all p 's > .09). Moreover, the groups did not differ on the parent and teacher report of SDQ disorder subscales, except for the emotional symptoms parent report: parents from adolescents with MID reported more emotional symptoms than parents from adolescents with BIF ($M_{MID} = 8.70$, $SD_{MID} = 2.87$, $M_{BIF} = 6.65$, $SD_{BIF} = 2.18$; $t(35) = 2.42$, $p = .02$). Finally, we checked whether sex influenced our results. Boys and girls did not significantly differ on donated coins in the four conditions (all p 's > .10). The distribution of boys and girls over the IQ groups did not differ significantly, $\chi^2(1) = 2.41$, $p = .12$.

3.2. Main analysis on prosocial peer influence

As the assumption of sphericity was violated in the mixed ANOVA ($W = .46$, $p < .001$), we used the Greenhouse-Geisser correction for within-subjects effects. The mixed ANOVA showed a significant main effect of condition, $F(2.16, 114) = 35.77$, $p < .001$, $\eta_p^2 = .49$ (see Fig. 2). As expected, contrasts showed a significant increase from the Solo1 to the Feedback condition ($p^B < .001$; $d = 1.40$). Exploratively, we found a significant increase in donations from the Solo1 to the Spectator condition ($p^B = .03$; $d = .43$). Also, adolescents significantly increased their donations from the Spectator to the Feedback condition ($p^B < .001$; $d = 1.42$). Furthermore, the decrease in donations between the Feedback condition and the Solo2 condition ($M_{diff} = -.39$) was not significant after the Bonferroni correction ($p^B = .07$; $d = .36$). Finally, there was a significant increase in donations between the Solo1 condition and the Solo2 condition ($p^B < .001$; $d = .81$). The answers on the exit questions about motives for donating behavior are shown in Table 2.

The mixed ANOVA further showed a significant Condition \times Group effect, $F(2.16, 114) = 3.20$, $p = .04$, $\eta_p^2 = .08$ (see Fig. 2). The post-hoc tests showed that the BIF group demonstrated a larger increase in donations between the Solo1 and Feedback condition than the MID group ($p^B = .03$, $d = .86$). Both groups did not differ in their increase in donations between the Solo1 and Spectator condition ($p^B > 1$). Between the Spectator and Feedback condition, the BIF group demonstrated a larger increase in donations than the MID group ($p^B = .03$, $d = .88$). Although the decrease in donations between the Feedback and Solo2 condition seemed larger in the BIF group ($M_{diff} = -.77$) compared to the MID group ($M_{diff} = -.05$), this difference was not significant after Bonferroni correction ($p^B = .10$). The groups did also not differ in their increase from the Solo1 to Solo2 condition ($p^B > 1$).

3.3. Group differences on questionnaires

There were no significant differences between the MID and BIF group on the SRQ-A subscales, nor on the RPI or the SDQ Peer Problems and Prosocial Behavior parent and teacher reports (all p 's > .20, see Table 3).

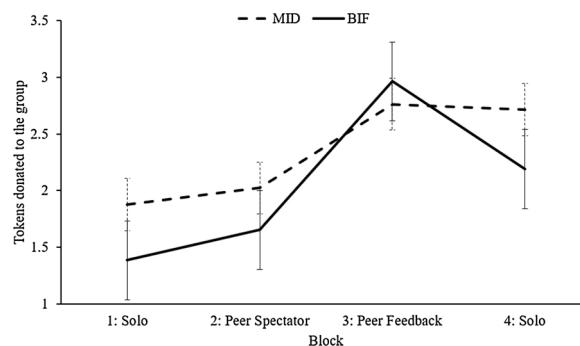


Fig. 2. Number of tokens donated to the group over the course of the Public Goods Game by adolescents with MID or BIF.

Table 2
Motives for Donating Behavior based on Exit Questions.

Exit question	Answers
Why did you donate coins to the group during the game?	52.5 % earning more money/coins
	17.5 % prosocial motives (e.g., because you need to share)
	10 % this was a procedure of the game
	7.5 % for more thumbs up
	12.5 % I do not know
Why did you keep coins to yourself during the game?	45 % to have more money/coins/to win
	22.5 % selfish motives not considering the group (e.g., I thought that was good)
	10 % selfish motives considering the group (e.g., I did not want to give it to the group)
	5 % I did not do that
While making choices, did you take into account the thumbs up that were given?	17.5 % I do not know
	60 % yes
	30 % no
	10 % sometimes

Table 3
Means and Standard Deviations on Questionnaires for All Adolescents and the MID and BIF group separately.

Questionnaire	All (N = 40)	MID (N = 21)	BIF (N = 19)	Group comparison
SRQ-A				
Passivity	2.46 (1.37)	2.71 (1.17)	2.18 (1.55)	$t(38) = 1.25, p = .22$
Prosocial Interactions	5.32 (1.34)	5.26 (1.33)	5.38 (1.39)	$t(38) = -.28, p = .78$
Sociability	4.68 (1.51)	4.65 (1.17)	4.72 (1.85)	$t(38) = -.14, p = .89$
RPI	2.40 (.51)	2.38 (.41)	2.42 (.61)	$t(38) = -.24, p = .81$
SDQ – parent ^a				
Peer Problems	2.22 (2.42)	2.65 (2.39)	1.71 (2.44)	$t(35) = 1.19, p = .24$
Prosocial Behavior	8.54 (1.64)	8.35 (1.50)	8.76 (1.82)	$t(35) = -.76, p = .45$
SDQ – teacher ^b				
Peer Problems	2.13 (1.98)	2.50 (2.09)	1.74 (1.82)	$t(37) = 1.21, p = .23$
Prosocial Behavior	7.51 (2.28)	7.20 (2.71)	7.84 (1.74)	$t(37) = -.88, p = .39$

Abbreviations: BIF Borderline Intellectual Functioning, MID Mild Intellectual Disability, RPI Resistance to Peer Influence Scale, SDQ Strengths and Difficulties Questionnaire, SRQ-A Adolescent Social Reward Questionnaire.

^a Three parents did not fill out the SDQ (n = 1 MID, n = 2 BIF).

^b One teacher did not fill out the SDQ (n = 1 MID).

3.4. Correlations between task and questionnaires

As the groups did not score differently on the questionnaires, we calculated partial correlations between the RPI, SRQ-A, and SDQ scores and task performance over the whole group, correcting for differences in age and IQ between the MID and BIF group (see Table 4). The Solo1-Feedback difference score was positively correlated with the SRQ-A Prosocial Interactions subscale ($r = .35, p = .045$). This suggests that a greater increase in prosocial behavior from performing alone to when peers provided feedback was related to more enjoyment of prosocial interactions. There were no significant correlations between the questionnaire scores and the Solo1-Spectator difference score. The Spectator-Feedback difference score was positively correlated with the SRQ-A Prosocial Interactions

Table 4
Partial Correlations (r) between the Questionnaires and the Peer Public Good Game Conditions Difference Scores.

Questionnaire	Solo1 - Feedback	Solo1 – Spectator	Spectator – Feedback	Feedback – Solo2	Solo1 – Solo2
SRQ-A					
Passivity	.08	-.10	.18	-.01	.08
Prosocial Interactions	.35*	.11	.35*	.36*	-.07
Sociability	.26	.09	.26	.46*	-.23
RPI	.07	-.04	.12	.15	-.09
SDQ-parent ^a					
Peer Problems	-.14	-.01	-.24	-.41*	.22
Prosocial Behavior	.07	.04	.07	.31	-.24
SDQ-teacher ^b					
Peer Problems	-.05	-.17	-.19	-.02	.01
Prosocial Behavior	.05	-.05	.10	-.03	.07

Abbreviations: RPI Resistance to Peer Influence Scale, SDQ Strengths and Difficulties Questionnaire, SRQ-A Adolescent Social Reward Questionnaire.

* = $p < .05$.

^a Three parents did not fill out the SDQ (n = 1 MID, n = 2 BIF).

^b One teacher did not fill out the SDQ (n = 1 MID).

subscale ($r = .35, p = .045$). This means that a greater increase in prosocial behavior from performing with peers present to when peers provided feedback was related to more enjoyment of prosocial interactions. The Feedback-Solo2 difference score was positively correlated with the SRQ-A Prosocial Interactions ($r = .36, p = .04$) and Sociability ($r = .46, p = .007$), and negatively correlated with the parental SDQ Peer Problem scores ($r = -.41, p = .02$). These correlations can be interpreted as that larger carryover effects were related to more enjoyment of prosocial interactions and more sociability as well as less peer problems. The Solo1-Solo2 difference score was not significantly correlated to any of the questionnaires (all p 's $> .17$). There were no significant correlations between the task and the SRQ-A Passivity, RPI or SDQ teacher reports.

4. Discussion

The current study aimed to investigate whether adolescents with MID or BIF are susceptible to peer influence on prosocial behavior. We administered an experimental donation task using four consecutive conditions: alone, with virtual peers present, with virtual peers providing positive feedback on prosocial behavior, and alone again. Our results support our hypothesis: adolescents with MID or BIF increased their prosocial behavior when peers provided positive feedback compared to when alone. This is in line with similar experimental studies in typically developing adolescents and adolescents with autism spectrum disorder (Chierchia et al., 2020; Choukas-Bradley et al., 2015; Van Hoorn et al., 2017; van Hoorn, Van Dijk, Meuwese et al., 2016). In addition, we now have initial evidence that this susceptibility to peer influence is not limited to risk taking (Bexkens et al., 2019; Wagemaker et al., 2020), or social judgements (Dekkers et al., 2017; Egger et al., 2021), but can also affect prosocial behavior (Busching & Krahé, 2020).

The explicit effect of peer feedback on prosocial behavior demonstrates that social reinforcement can increase prosocial behavior in adolescents with MID or BIF. For individuals with intellectual disability specifically, this effect could be driven by heightened outer-directedness: the tendency to rely on external cues from others to guide behavior. Indeed, the explicit peer feedback could have provided adolescents with MID or BIF with useful information on how to perform the task. High outer-directedness in individuals with intellectual disability may originate from frequent experiences of failure in their lives (e.g., Tanaka et al., 2001). Moreover, it could be compounded by a strong desire to belong socially (Strnadová et al., 2018), strong social desirability (Langdon et al., 2010), and feelings of lower self-efficacy (Khemka & Hickson, 2006), which make adolescents with MID or BIF more prone to trusting others instead of relying on their own ideas (Greenspan et al., 2011).

Our exploration of peer presence effects showed that adolescents with MID or BIF already increased their prosocial behavior when peers were present compared to when alone. This peer presence effect was also found in a similar study with typically developing adolescents (Van Hoorn, Van Dijk, Güroğlu et al., 2016), while it was not found in another similar study with typically developing adolescents and adolescents with autism spectrum disorder (Van Hoorn et al., 2017). Although we are not aware of studies on peer presence effects in individuals with an intellectual disability, our finding suggests that adolescents with MID or BIF are also susceptible to implicit peer influences. As the peers did not provide any explicit cues, this implies that besides outer-directedness, social factors such as peer norms also play a role (see e.g., Berger, 2008; Deutsch & Gerard, 1955). Nevertheless, explicit peer feedback increased prosocial behavior even further than only peer presence, suggesting an additive effect of implicit social factors and explicit feedback on prosocial behavior. Future research could further study differences between implicit and explicit peer influences on adolescents with MID or BIF.

Our second exploration demonstrated a carryover effect: no decrease in donations after peers were no longer present. This is in line with earlier studies in typically developing adolescents (Choukas-Bradley et al., 2015; but see Van Hoorn et al., 2017; van Hoorn, Van Dijk, Meuwese et al., 2016). Carryover effects could be interpreted as evidence that social learning took place. Indeed, adolescents with MID or BIF potentially learned peer norms after getting positive peer feedback on their prosocial behavior (Bandura, 1986). However, an alternative explanation could be a certain rigidity in the chosen strategy, given that no new information was presented after the peers had left. As we were the first to find these results, further research on carryover effects in adolescents with MID or BIF is warranted to get traction on these explanations.

4.1. Identifying group and individual differences

When comparing adolescents with MID to adolescents with BIF, both groups were highly similar on the self-report and parent report of resistance to peer influence, experience of social rewards, prosocial behavior, and peer problems. On the experimental task, both groups equally increased their prosocial behavior in response to peer presence, but the peer feedback effect on prosocial behavior was stronger for adolescents with BIF compared to adolescents with MID. This suggests that at the behavioral level some heterogeneity in the combined MID/BIF group may exist. More specifically, compared to implicit peer norms, explicit social cues or reinforcement may play a more important role for adolescents with BIF than for adolescents with MID. This finding is not easy to interpret given that the outer-directedness literature proposes that MID is related to more outer-directedness compared to BIF (Tanaka et al., 2001) and thus more susceptibility to external cues. It seems likely that the learning process of both groups is slightly different, potentially adolescents with BIF were better in linking the positive peer feedback to their donating behavior than adolescents with MID because of their better working memory (Schuchardt et al., 2010). Our result emphasizes that research into differences between adolescents with MID and adolescents with BIF is highly important (Nouwens et al., 2017).

When relating our experimental task to the questionnaires, we found that stronger susceptibility to explicit peer influence on prosocial behavior (as indicated by larger peer feedback and carryover effects) was related to more enjoyment of prosocial interactions and sociability, and less peer problems. Earlier research did not establish relations between more enjoyment of prosocial interaction and sociability and the same task in adolescents without MID or BIF (Hoorn et al., 2016). Nevertheless, these results could suggest that

explicit peer influence in adolescents with MID or BIF is not solely explained by outer-directedness, but that social factors also play a role. Moreover, it may indicate that explicit peer influence could be stronger for adolescents with better social skills. Future research could further investigate individual differences in adolescents with and without MID or BIF in relation to susceptibility to peer influence on prosocial behavior.

4.2. Limitations

We acknowledge a few limitations of our study. First, we did not include a control group of typically developing adolescents, which means that we cannot claim that adolescents with MID or BIF are more or less susceptible to peer influence on prosocial behavior than typically developing adolescents. Adding a control group could be a next step in research to obtain more knowledge about similarities or differences between adolescents with and without ID in their susceptibility to peer influence on prosocial behavior and related prosocial goals and needs (Fuligni, 2019). Second, because of time constraints we did not measure limitations in adaptive behavior, which is an important aspect of the definition of intellectual disability (American Psychiatric Association, 2013). As we recruited our sample on practical vocational schools which have strict admittance criteria, and are specialized in MID and BIF, we are confident that our sample had limited adaptive functioning. Nevertheless, future research could use the Adaptive Behavior Assessment Scale for teachers (Harrison & Oakland, 2015). Third, the selection of an experimental social dilemma poses some limitations for our conclusions. We currently only focused on one aspect of prosocial behavior: cooperation. Future research could study peer effects on other important aspects of prosocial behavior such as sharing and altruistic helping. In addition, it will be valuable to relate these effects to real-life behavior, such as donating behavior (see also Benz & Meier, 2008). Relatedly, our carryover effect was only tested in a similar, immediately following situation and may therefore be highly context-dependent. As long term generalization of learned skills is often problematic for adolescents with an intellectual disability (Zoon, 2012), we encourage future studies on the generalization of prosocial behavior encouraged by peers in this group. Fourth, although our sample size provided sufficient power to detect medium effects, future research could consider recruiting a larger sample to confirm our borderline significant follow-up findings. This could also be useful to detect potential moderators of the peer influence effects such as comorbid diagnoses.

4.3. Conclusions

Although replication of our results in more naturalistic settings is warranted, we demonstrated that a prosocial peer context may promote prosocial behavior in adolescents with MID or BIF. Based on our task results it could be proposed that in a situation where adolescents can choose to demonstrate prosocial behavior or not, only the presence of unknown peers may already increase prosocial behavior. More importantly, a context of positive peer feedback may be an even stronger motivator for adolescents with MID or BIF to demonstrate prosocial behavior. Finally, even after the peers were no longer present, the increase in prosocial behavior was to some extent maintained. Based on these results, we argue that clinicians should be aware of the potential of peer influence in positive development. In addition to the belief that peer influence in interventions is harmful (e.g., Dishion et al., 1999), our study provides evidence for potential positive effects (see for an example Stanish & Temple, 2012) and emphasizes that prosocial behavior is an important motive also for adolescents with MID or BIF (Fuligni, 2019). It is still unknown whether the absence of prosocial peers can provide a risk factor for showing less prosocial behavior. Future research could study the socialization of prosocial behavior in peer groups over time. Finally, we found hints that the effects of peer influence on prosocial behavior may be stronger for certain subgroups (i.e., adolescents with BIF and adolescents with more enjoyment of prosocial interactions and sociability and less peer problems) which provide fruitful areas for future research.

Participating in prosocial behavior could be highly beneficial for adolescents with MID or BIF and the current study provides first evidence that the influences of their peers could be a port-of-entry for stimulating this behavior. We therefore conclude that susceptibility to peer influence may not only have negative consequences on the behavior of adolescents with MID or BIF, such as an increase in risk-taking behavior, but could also have positive effects such as an increase in prosocial behavior.

Data availability

Data will be made available on request.

Funding

Not applicable.

Ethics

The work described has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans.

CRediT authorship contribution statement

Eline Wagemaker: Formal analysis, Writing - original draft, Writing - review & editing, Visualization. **Jorien van Hoorn:**

Methodology, Writing - original draft, Writing - review & editing. **Anika Bexkens:** Conceptualization, Investigation, Data curation, Writing - original draft, Writing - review & editing.

Declaration of Competing Interest

The authors declare that there is no conflict of interest.

Acknowledgements

The authors thank Susanne van Giessen for her valuable assistance in gathering the data.

References

- Altikulac, S., Bos, M. G. N., Foulkes, L., Crone, E. A., van Hoorn, J., Altikulac, S., ... van Hoorn, J. (2019). Age and gender effects in sensitivity to social rewards in adolescents and young adults. *Frontiers in Behavioral Neuroscience*, *13*, 171. <https://doi.org/10.3389/FNBEH.2019.00171>
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). <https://doi.org/10.1176/appi.books.9780890425596>
- Bailey, T., Totsika, V., Hastings, R. P., Hatton, C., & Emerson, E. (2019). Developmental trajectories of behaviour problems and prosocial behaviours of children with intellectual disabilities in a population-based cohort. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *60*(11), 1210–1218. <https://doi.org/10.1111/jcpp.13080>
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.
- Becker, A., Rothenberger, A., & Sohn, A. (2015). Six years ahead: A longitudinal analysis regarding course and predictive value of the Strengths and Difficulties Questionnaire (SDQ) in children and adolescents. *European Child and Adolescent Psychiatry*, *24*(6), 715–725. <https://doi.org/10.1007/s00787-014-0640-x>
- Benz, M., & Meier, S. (2008). Do people behave in experiments as in the field?—evidence from donations. *Experimental Economics*, *11*, 268–281. <https://doi.org/10.1007/s10683-007-9192-y>
- Berger, J. (2008). Identity signalling, social influence, and social contagion. In P. M. J. & D. K. A. (Eds.), *Understanding peer influence in children and adolescents* (pp. 181–199). Guilford Press. <https://doi.org/10.1111/j.1475-3588.2011.00617.10.x>
- Bexkens, A., Huizenga, H. M., Neville, D. A., Collot d'Escury-Koenigs, A. L., Bredman, J. C., Wagemaker, E., & Van der Molen, M. W. (2019). Peer-influence on risk-taking in male adolescents with mild to borderline intellectual disabilities and/or behavior disorders. *Journal of Abnormal Child Psychology*, *47*(3), 543–555. <https://doi.org/10.1007/s10802-018-0448-0>
- Brechwald, W. A., & Prinstein, M. J. (2011). Beyond homophily: A decade of advances in understanding peer influence processes. *Journal of Research on Adolescence*, *21*(1), 166–179. <https://doi.org/10.1111/j.1532-7795.2010.00721.x>
- Busching, R., & Krahé, B. (2020). With a little help from their peers: The impact of classmates on adolescents' development of prosocial behavior. *Journal of Youth and Adolescence*, *49*(9), 1849–1863. <https://doi.org/10.1007/s10964-020-01260-8>
- Chierchia, G., Pi-Sunyer, B. P., & Blakemore, S. J. (2020). Prosocial influence and opportunistic conformity in adolescents and young adults. *Psychological Science*, *1*–17. <https://doi.org/10.1177/0956797620957625>
- Choukas-Bradley, S., Giletta, M., Cohen, G. L., & Prinstein, M. J. (2015). Peer influence, peer status, and prosocial behavior: An experimental investigation of peer socialization of adolescents' intentions to volunteer. *Journal of Youth and Adolescence*, *44*(12), 2197–2210. <https://doi.org/10.1007/s10964-015-0373-2>
- Cohen, J. (2013). Statistical power analysis for the behavioral sciences. *Statistical power analysis for the behavioral sciences*. <https://doi.org/10.4324/9780203771587>
- Contena, B., & Taddei, S. (2017). Psychological and cognitive aspects of borderline intellectual functioning: A Systematic Review. *European Psychologist*, *22*(3), 159–166. <https://doi.org/10.1027/1016-9040/a000293>
- Crone, E. A., Will, G.-J., Overgaauw, S., & Güroglu, B. (2014). Social decision-making in childhood and adolescence. In P. A. M. Van Lange, B. Rockenbach, & T. Yamagishi (Eds.), *Social dilemmas: New perspectives on reward and punishment* (pp. 1–14). Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780199300730.003.0001>
- De Beer, Y. (2016). *Kompas Licht Verstandelijke Beperking: definitie, aspecten en ondersteuning*. SWP.
- Dekkers, L. M. S., Bexkens, A., Hofman, A. D., Boeck, P. D., Collot d'Escury, A. L., & Huizenga, H. M. (2017). Formal modeling of the resistance to peer influence questionnaire. *Assessment*, *26*(6), 1070–1083. <https://doi.org/10.1177/1073191117698754>
- Deutsch, M., & Gerard, H. B. (1955). A study of normative and informational social influences upon individual judgment. *Journal of Abnormal and Social Psychology*, *51* (3), 629–636. <https://doi.org/10.1037/H0046408>
- Dishion, T. J., McCord, J., & Poulin, F. (1999). When interventions harm - Peer groups and problem behavior. *American Psychologist*, *54*(9), 755–764. <https://doi.org/10.1037/0003-066X.54.9.755>
- Do, K. T., Guassi Moreira, J. F., & Telzer, E. H. (2017). But is helping you worth the risk? Defining prosocial risk taking in adolescence. *Developmental Cognitive Neuroscience*, *25*, 260–271. <https://doi.org/10.1016/J.DCN.2016.11.008>
- Do, K. T., Prinstein, M. J., & Telzer, E. H. (2020). Neurobiological susceptibility to peer influence in adolescence. *Handbook of developmental cognitive neuroscience*. <https://www.researchgate.net/publication/332655929>.
- Egger, S., Nicolay, P., Huber, C., & Müller, C. M. (2021). Increased openness to external influences in adolescents with intellectual disability: Insights from an experimental study on social judgments. *Research in Developmental Disabilities*, *113*, Article 103918. <https://doi.org/10.1016/j.ridd.2021.103918>
- Eisenberg, N., Fabes, R. A., & Spinrad, T. L. (2006). Handbook of child psychology. In *Social, emotional, and personality development* (6th ed., Vol. 3). John Wiley & Sons, Inc. <https://doi.org/10.1002/9780470147658.chpsy0311>
- Elberling, H., Linneberg, A., Olsen, E. M., Goodman, R., & Skovgaard, A. M. (2010). The prevalence of SDQ-measured mental health problems at age 5-7 years and identification of predictors from birth to preschool age in a Danish birth cohort: The Copenhagen Child Cohort 2000. *European Child and Adolescent Psychiatry*, *19* (9), 725–735. <https://doi.org/10.1007/s00787-010-0110-z>
- Emerson, E. (2005). Use of the Strengths and Difficulties Questionnaire to assess the mental health needs of children and adolescents with intellectual disabilities. *Journal of Intellectual and Developmental Disability*, *30*(1), 14–23. <https://doi.org/10.1080/13668250500033169>. Routledge.
- Emerson, E., & Hatton, C. (2007). Mental health of children and adolescents with intellectual disabilities in Britain. *The British Journal of Psychiatry: The Journal of Mental Science*, *191*(6), 493–499. <https://doi.org/10.1192/bjp.bp.107.038729>
- Fulgini, A. J. (2019). The need to contribute during adolescence. *Perspectives on Psychological Science*, *14*(3), 331–343. <https://doi.org/10.1177/1745691618805437>
- Gerbino, M., Zuffiano, A., Eisenberg, N., Castellani, V., Luengo Kanacri, B. P., Pastorelli, C., & Caprara, G. V. (2018). Adolescents' prosocial behavior predicts good grades beyond intelligence and personality traits. *Journal of Personality*, *86*(2), 247–260. <https://doi.org/10.1111/jopy.12309>
- Goodman, R., Ford, T., Simmons, H., Gatward, R., & Meltzer, H. (2000). Using the Strengths and Difficulties Questionnaire (SDQ) to screen for child psychiatric disorders in a community sample. *British Journal of Psychiatry*, *177*(6), 534–539. <https://doi.org/10.1192/bjp.177.6.534>
- Greenspan, S., Switzky, H. N., & Woods, G. W. (2011). Intelligence involves risk-awareness and intellectual disability involves risk-unawareness: Implications of a theory of common sense. *Journal of Intellectual Disability*, *36*(4), 246–257. <https://doi.org/10.3109/13668250.2011.626759>
- Harbaugh, W. T., & Krause, K. (2000). Children's altruism in public good and dictator experiments. *Economic Inquiry*, *38*(1), 95–109. <https://doi.org/10.1111/j.1465-7295.2000.tb00006.x>
- Harrison, P. L., & Oakland, T. (2015). *Adaptive behavior assessment system* (3rd ed.). Western Psychological Services. https://doi.org/10.1007/978-3-319-57111-9_1506

- Hoorn, J. Van, Dijk, E. Van, Güroğlu, B., & Crone, E. A. (2016). Neural correlates of prosocial peer influence on public goods game donations during adolescence. *Social Cognitive and Affective Neuroscience*, 11(6), 923–933. <https://doi.org/10.1093/scan/nsw013>
- Jennings, P. A., & Greenberg, M. T. (2009). The prosocial classroom: Teacher social and emotional competence in relation to student and classroom outcomes. *Review of Educational Research*, 79(1), 491–525. <https://doi.org/10.3102/0034654308325693>
- Jung, J., & Schröder-Abé, M. (2019). Prosocial behavior as a protective factor against peers' acceptance of aggression in the development of aggressive behavior in childhood and adolescence. *Journal of Adolescence*, 74(June), 146–153. <https://doi.org/10.1016/j.adolescence.2019.06.002>
- Khemka, I., & Hickson, L. (2006). The role of motivation in the decision making of adolescents with mental retardation. *International Review of Research in Mental Retardation*, 31(05), 73–115. [https://doi.org/10.1016/S0074-7750\(05\)31003-2](https://doi.org/10.1016/S0074-7750(05)31003-2)
- Khemka, I., Hickson, L., Casella, M., Accetturi, N., & Rooney, M. E. (2009). Impact of coercive tactics on the decision-making of adolescents with intellectual disabilities. *Journal of Intellectual Disability Research*, 53(4), 353–362. <https://doi.org/10.1111/j.1365-2788.2009.01152.x>
- Langdon, P. E., Clare, I. C. H., & Murphy, G. H. (2010). Measuring social desirability amongst men with intellectual disabilities: The psychometric properties of the Self- and Other-Deception Questionnaire—Intellectual Disabilities. *Research in Developmental Disabilities*, 31(6), 1601–1608. <https://doi.org/10.1016/J.RIDD.2010.05.001>
- Meltzer, H., Gatward, R., Goodman, R., & Ford, T. (2003). Mental health of children and adolescents in Great Britain. *International Review of Psychiatry*, 15(1–2), 185–187. <https://doi.org/10.1080/0954026021000046155>. Taylor & Francis.
- Memmott-Elison, M. K., Holmgren, H. G., Padilla-Walker, L. M., & Hawkins, A. J. (2020). Associations between prosocial behavior, externalizing behaviors, and internalizing symptoms during adolescence: A meta-analysis. *Journal of Adolescence*, 80, 98–114. <https://doi.org/10.1016/j.adolescence.2020.01.012>
- Müller, C. M., Cillessen, A. H. N., Egger, S., & Hofmann, V. (2021). Peer influence on problem behaviors among students with intellectual disabilities. *Research in Developmental Disabilities*, 114, Article 103994. <https://doi.org/10.1016/J.RIDD.2021.103994>
- Nouwens, P. J. G., Lucas, R., Smulders, N. B. M., Embregts, P. J. C. M., & van Nieuwenhuizen, C. (2017). Identifying classes of persons with mild intellectual disability or borderline intellectual functioning: A latent class analysis. *BMC Psychiatry*, 17(1), 257. <https://doi.org/10.1186/s12888-017-1426-8>
- Penner, L. A., Dovidio, J. F., Piliavin, J. A., & Schroeder, D. A. (2005). Prosocial behavior: Multilevel perspectives. *Annual Review of Psychology*, 56, 365–392. <https://doi.org/10.1146/annurev.psych.56.091103.070141>. Annual Reviews.
- Schuchardt, K., Gebhardt, M., & Mäehler, C. (2010). Working memory functions in children with different degrees of intellectual disability. *Journal of Intellectual Disability Research*, 54(4), 346–353. <https://doi.org/10.1111/j.1365-2788.2010.01265.x>
- Son, D., & Padilla-Walker, L. M. (2020). Happy helpers: A multidimensional and mixed-method approach to prosocial behavior and its effects on friendship quality, mental health, and well-being during adolescence. *Journal of Happiness Studies*, 21(5), 1705–1723. <https://doi.org/10.1007/s10902-019-00154-2>
- Stanish, H. I., & Temple, V. A. (2012). Efficacy of a peer-guided exercise programme for adolescents with intellectual disability. *Journal of Applied Research in Intellectual Disabilities*, 25(4), 319–328. <https://doi.org/10.1111/j.1468-3148.2011.00668.x>
- Steinberg, L., & Monahan, K. C. (2007). Age differences in resistance to peer influence. *Developmental Psychology*, 43(6), 1531–1543. <https://doi.org/10.1037/0012-1649.43.6.1531>
- Strnadová, I., Johnson, K., & Walmsley, J. (2018). "... But if you're afraid of things, how are you meant to belong?" what belonging means to people with intellectual disabilities? *Journal of Applied Research in Intellectual Disabilities*, 31(6), 1091–1102. <https://doi.org/10.1111/JAR.12469>
- Sumter, S. R., Bokhorst, C. L., Steinberg, L., & Westenberg, P. M. (2009). The developmental pattern of resistance to peer influence in adolescence: Will the teenager ever be able to resist? *Journal of Adolescence*, 32(4), 1009–1021. <https://doi.org/10.1016/j.adolescence.2008.08.010>
- Tanaka, M., Malakoff, M. E., Bennett-Gates, D., & Zigler, E. (2001). Development of an outerdirected style of problem solving in individuals with and without mental retardation. *Journal of Applied Developmental Psychology*, 22(2), 191–198. [https://doi.org/10.1016/S0193-3973\(01\)00076-4](https://doi.org/10.1016/S0193-3973(01)00076-4)
- Telzer, E. H., van Hoorn, J., Rogers, C. R., & Do, K. T. (2018). Social influence on positive youth development: A developmental neuroscience perspective. *Advances in Child Development and Behavior*, 54, 215–258. <https://doi.org/10.1016/bs.acdb.2017.10.003>. Academic Press Inc.
- Theunissen, M. H. C., de Wolff, M. S., & Reijneveld, S. A. (2019). The strengths and difficulties questionnaire self-report: A valid instrument for the identification of emotional and behavioral problems. *Academic Pediatrics*, 19(4), 471–476. <https://doi.org/10.1016/j.acap.2018.12.008>
- Tipton, L. A., Christensen, L., & Blacher, J. (2013). Friendship quality in adolescents with and without an intellectual disability. *Journal of Applied Research in Intellectual Disabilities*, 26(6). <https://doi.org/10.1111/jar.12051>. n/a–n/a.
- UNESCO. (1999). *International standard classification of education—ISCED*. Author.
- van Hoorn, J., van Dijk, E., Crone, E. A., Stockmann, L., & Rieffe, C. (2017). Peers influence prosocial behavior in adolescent males with autism Spectrum disorders. *Journal of Autism and Developmental Disorders*, 47(7), 2225–2237. <https://doi.org/10.1007/s10803-017-3143-z>
- van Hoorn, J., van Dijk, E., Güroğlu, B., & Crone, E. A. (2016). Neural correlates of prosocial peer influence on public goods game donations during adolescence. *Social Cognitive and Affective Neuroscience*, 11(6), 923–933. <https://doi.org/10.1093/scan/nsw013>
- van Hoorn, J., van Dijk, E., Meuwese, R., Rieffe, C., & Crone, E. A. (2016). Peer influence on prosocial behavior in adolescence. *Journal of Research on Adolescence*, 26(1), 90–100. <https://doi.org/10.1111/jora.12173>
- Vugteveen, J., de Bildt, A., Theunissen, M., Reijneveld, M., & Timmerman, M. (2019). Validity aspects of the Strengths and Difficulties Questionnaire (SDQ) adolescent self-report and parent-report versions among Dutch adolescents. *Assessment*, 1–16. <https://doi.org/10.1177/1073191119858416>
- Wagemaker, E., Huizenga, H. M., Dekkers, T. J., Collot d'Escury-Koenigs, A., Saleminck, E., & Bexkens, A. (2020). When do those "risk-taking adolescents" take risks? The combined effects of risk encouragement by peers, mild-to-borderline intellectual disability and sex. *Journal of Abnormal Child Psychology*, 1–15. <https://doi.org/10.1007/s10802-020-00617-8>
- Wentzel, K. R. (1993). Does being good make the grade? Social behavior and academic competence in middle school. *Journal of Educational Psychology*, 85(2), 357–364. <https://doi.org/10.1037/0022-0663.85.2.357>
- Wieland, J., & Zitman, F. G. (2016). It is time to bring borderline intellectual functioning back into the main fold of classification systems. *BJPsych Bulletin*, 40(4), 204–206. <https://doi.org/10.1192/pb.bp.115.051490>
- Zoon, M. (2012). *Wat werkt bij jeugdigen met een licht verstandelijke beperking?/What works for adolescents with mild-to-borderline intellectual disability?*. http://www.nji.nl/nl/LVB_Wat_werkt.pdf.