



Classroom peer effects on adaptive behavior development of students with intellectual disabilities

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ABSTRACT

Children and adolescents with intellectual disabilities (ID) exhibit low levels of adaptive behaviors (i.e., conceptual, social, and practical skills). In typical development such competences are learned in part from peers at school. Less is known about such influence from classmates in students with ID. We investigated classroom-level peer effects in 1125 students with ID (69% boys), mean age 11.30 years ($SD = 3.75$), who attended special needs schools. School staff members reported on students' adaptive behaviors at the beginning and end of one school year. Multilevel analyses showed a classroom peer context effect for conceptual skills, controlling for students' earlier skills, age, and gender. This indicated that students' individual conceptual skills increased more, when their classmates in special needs classrooms had greater conceptual skills. No such classroom peer effect was found for social and practical competences. Implications for supporting children and adolescents with ID are discussed.

Students' competence development at school is influenced not only by individual dispositions, teachers, and family background, but also by their peer group. Classmate characteristics are known to impact students' individual skill development (for reviews, see Dumont, Neumann, Maaz, & Trautwein, 2013; Müller & Zurbriggen, 2016). For example, classmate abilities predict individual students' future school achievement, controlling for their own earlier achievement (e.g., De Fraine, Van Damme, Van Landeghem, Opdenakker, & Onghena, 2003). Various processes, such as peer modeling and adaptation to prevailing norms in the classroom, have been suggested as possible mechanisms underlying such peer effects (e.g., Harris, 2010).

While the influence of the classroom peer context on competence development at school is well established for typically developing children and adolescents, less is known about the effect of peers on students with intellectual disabilities (ID) in their classrooms. ID is defined by significant limitations in both intellectual functioning (i.e., $IQ < 70$) and adaptive behaviors (i.e., conceptual, social, and practical everyday life skills) with levels of competence two standard deviations below the population mean. Furthermore, there must be evidence of the disability before the age of 22 years (American Association on Intellectual and Developmental Disabilities, 2021). The prevalence of ID is estimated to range between 0.05 and 1.55% (McKenzie, Milton, Smith, & Ouellette-

Kuntz, 2016). Individuals with ID often have co-occurring mental and physical health problems and usually require life-long professional support in their everyday lives (e.g., Matson, 2019). In the US, 5.5% of all students with ID and 17.7% of those with multiple disabilities attend separate schools (U.S. Department of Education, 2019). In many European countries the percentages of students with ID attending special needs schools are even higher, for example Germany (86.6%, Kultusministerkonferenz, 2020) or the Netherlands (80–99%, Smits & Schoonheim, 2016).

Given the difficulties students with ID experience in basic skill acquisition and the fact that many attend specialized schools, it is important to study how the classroom peer context affects their skill development. In terms of skills, we focused on the three domains of adaptive behaviors, as described by Tassé (2013): (1) *conceptual skills* include functional academics, communication abilities, and self-direction; (2) *social skills* encompass, for example, interpersonal skills, social responsibility, rules following, and self-esteem; (3) *practical skills* include basic personal care abilities, such as hygiene, domestic skills, and health and safety. All of these skills represent important areas of support and instruction in special needs education (e.g., Lee, Schweers, & Loftin, 2019). By investigating classroom-level peer effects on these adaptive competences in students with ID, the present study can help to

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illuminate how classmate characteristics are associated with skill development in a student population that experiences severe challenges in learning.

Classmates' influence on typically developing students

Peer influence can be considered for different types of peer groups. Many studies focus on the influence of "voluntary" peers, such as personal friends from one's own classroom, school, or neighborhood, or even peers whom youths meet only on social media (for an overview, see, e.g., [Hojjat & Moyer, 2017](#)). Other studies investigate effects of "involuntary" peers (e.g., [Juvonen & Galván, 2008](#)), that is, the peers that surround children or adolescents due to institutional placements. A typical example of involuntary peers are youths' classmates in a classroom – they did not select them but need to interact with them on a daily basis.

Among typically developing students, higher levels of classmates' competence are often associated with higher subsequent individual competences, taking into account students' earlier individual competences ([Dumont et al., 2013](#)). This association has been demonstrated across different domains of adaptive behavior. For the conceptual domain, classroom peer effects have been found for academic competences, such as math and language achievement, but also for executive functioning (e.g., [Carman & Zhang, 2012](#); [De Fraine et al., 2003](#); [Duru-Bellat & Minga, 1998](#); [Finch, García, Sulik, & Obradović, 2019](#); [Hanushek, Kain, Markman, & Rivkin, 2003](#); [Kang, 2007](#); [Kiss, 2013](#); [Mashburn, Justice, Downer, & Pianta, 2009](#); [Opdenakker, Van Damme, De Fraine, Van Landeghem, & Onghena, 2002](#)). In the social domain, classroom peer context has been shown to influence individual development of prosocial, aggressive, disruptive, and delinquent behaviors (e.g., [Araos, Cea, Fernandez, & Valenzuela, 2014](#); [Barth, Dunlap, Dane, Lochman, & Wells, 2004](#); [Hofmann & Müller, 2018](#); [Kellam, Ling, Merisca, Brown, & Jalongo, 1998](#); [Kuppens, Grietens, Onghena, Michiels, & Subramanian, 2008](#); [Mercer, McMillen, & DeRosier, 2009](#); [Müller, Hofmann, Begert, & Cillessen, 2018](#); [Müller, Hofmann, Fleischli, & Studer, 2016](#); [Thomas, Bierman, Powers, & Conduct Problems Research Group, 2011](#)). In the practical domain, which involves basic personal care and domestic skills, the influence of the classroom peer context has not been much investigated among typically developing students, likely due to decreased focus by mainstream school systems on these competences compared to special needs education.

Several processes have been suggested as likely mechanisms underlying peer influence in general and the effects of the classroom peer context specifically (for reviews, see e.g., [Brechwald & Prinstein, 2011](#); [Harris, 2010](#); [Ryan & Shin, 2018](#)). As students spend much of the day interacting with their classmates, there exist many opportunities for peer learning from classmates and many mechanisms through which it may occur ([Harris, 2010](#)). For example, students discuss academic topics with their peers and receive problem-solving help from them ([Ryan & Shin, 2018](#)). Further, they learn from observing peer models and experience vicarious reinforcement when classmates conform or deviate from group norms ([Bandura, 1986](#); [Dishion & Tipsord, 2011](#)). Higher competence levels in a classroom can therefore be expected to result in more effective modeling, higher quality peer feedback, and more motivation for learning which may all contribute to individual students' achievement. An indirect effect of the peer context is that teachers base their expectations of the classroom on the characteristics of the students who compose it and adapt their teaching styles accordingly, which in turn may affect students' development ([Harris, 2010](#)). In this line of reasoning, it is expected that teachers form more positive expectations for students with higher levels of achievement which in turn predict the use of more effective teaching strategies and accordingly more progress of these students ([Proctor, 1984](#)). While there is evidence for several aspects of this process (e.g., [Brault, Janosz, & Archambault, 2014](#)), a mediation of classroom composition effects by teacher variables has not always been found (e.g., [Luyten & van der Hoeven-van Doornum, 1995](#)).

Classmates' influence on students with ID

Few studies have investigated in how far classmate characteristics influence the development of students with ID. It is therefore important to consider first the broader context of research on susceptibility to social influence and its developmental prerequisites in individuals with ID.

In order to be influenced socially, students with ID need to have basic social information processing skills that enable them to integrate relevant information from their environment. Social information processing includes, for example, the encoding and interpretation of social information, emotion regulation, and the generation and enactment of one's own responses ([Crick & Dodge, 1994](#); [Lemerise & Arsenio, 2000](#)). Individuals with ID may reach such competences later in development and not to the same degree as their typically developing peers. Studies show that lower levels of cognitive functioning and associated deficiencies in working memory, emotion recognition, and emotion interpretation are correlated with problems in social information processing ([van Nieuwenhuijzen & Vriens, 2012](#); [van Nieuwenhuijzen, Orobio de Castro, Wijnroks, Vermeer, & Matthys, 2004](#)). Problems include encoding more negative information from the environment and being less assertive and more submissive in social problem solving (e.g., [van Nieuwenhuijzen et al., 2004](#)). Despite these challenges, the behaviors of individuals with ID are affected by social rewards (e.g., [Lloyd & Kennedy, 2014](#); [Mace & Lalli, 1991](#); [Oliver, Hall, & Murphy, 2005](#); [Richman & Lindauer, 2002](#)), which indicates that students with ID can process basic social information.

Motivational aspects may also enhance social influence, such as the need for relatedness (see [Deci & Ryan, 2000](#)). Individuals with ID who are able to communicate on such topics report a strong desire to belong socially ([Strnadová, Johnson, & Walmsley, 2018](#)) and avoid being seen as different, which may increase their social orientation (for a review, see [Snell et al., 2009](#)). Research on outerdirectedness further suggests that individuals with ID tend to rely on external cues from other people to guide their behavior because they have often experienced failure ([Bybee & Zigler, 1998](#)). These findings suggest that students with ID are susceptible to social influence.

In addition to these general findings on social influence susceptibility in ID, a few studies have examined the specific influence of peers on children and adolescents with ID. Most of these studies did not investigate classroom-level peer effects, but focused on the influence of other types of peer groups. [Strichart \(1974\)](#) reported that adolescents with ID imitated peers without ID (selected based on being liked or disliked by the participants) and that the degree of imitation depended on the perceived competence levels of the peer. [Steinberg and Monahan \(2007\)](#) found that juvenile offenders with a lower IQ reported less resistance to peer influence than those with a higher IQ (see also [Dekkers et al., 2019](#)). Experimental studies also found greater susceptibility to influence from virtually presented peers on risk-taking behaviors and social decision making among adolescents with ID than comparison groups ([Bexkens et al., 2018](#); [Egger, 2021](#); [Egger, Nicolay, Huber, & Müller, 2021](#); [Wagemaker et al., 2020](#)). Sensitivity to peers is not limited to individuals with less severe forms of ID. Persons with profound levels of ID and/or multiple disabilities have also shown changes in their behavior (e.g., laughter), motor responses (e.g., head holding), and heart rates in response to peers ([Brady, Martin, Williams, & Burta, 1991](#); [Logan et al., 1998](#); [Nijs & Maes, 2014](#); [Scherler & Müller, 2018](#)). We know of only one study that investigated classroom peer effects in students with ID, focusing on problem behavior development. [Müller, Cillessen, Egger, and Hofmann \(2021\)](#) analyzed data assessed in the longitudinal study on which we also report in this paper. They found that in special needs classroom for students with diverse levels of ID, higher classroom levels of anxiety, problems relating socially, and communication disturbances predicted an increase of such problems in individual students with ID.

To our knowledge, peer influence on adaptive behavior development in ID has only been addressed in intervention studies. [Carter \(2018\)](#)

reviewed the impact of peer support (e.g., peer partners trained to use communication prompts), peer networks (e.g., offering thematic group meetings among peers), and peer partner interventions (e.g., buddy programs) on academic and social competence in students with ID. Well-prepared peer tutoring appears to be effective in teaching adaptive behaviors to students with ID, including conceptual skills (Alzahrani & Leko, 2018; Calhoun & Fuchs, 2003; McDonnell, Mathot-Buckner, Thorson, & Fister, 2001) and social competence (Sukhodolsky & Buter, 2007). While these studies provide important insights into peer intervention effects, they do not offer information on naturally occurring peer socialization processes for adaptive behaviors.

In summary, existing research provides evidence that students with ID are generally susceptible to social influence from others and that their adaptive behavior development can benefit from explicit peer interventions. However, to our knowledge, no study has yet examined the influence of classmates on adaptive behaviors in daily socialization processes in classrooms outside of intervention programs for students with ID in special needs schools. It is also unclear whether such influence occurs across all three adaptive behavior domains (i.e., conceptual, social, and practical), or whether it is specific to certain domains.

The current study

The goal of this study was to examine whether classroom levels of conceptual, social, and practical adaptive behaviors in special needs schools influenced students' individual development of these competences. We collected data in special needs schools for students with ID at two measurement points across one school year. We expected that higher levels of classroom-level adaptive behaviors at T1 would significantly predict higher levels of individual adaptive behaviors at T2, controlling for individual adaptive behaviors at T1. Given the state of research on classroom-level peer effects for typically developing students and the lack of knowledge on this issue for students with ID, we expected this association for all three domains of adaptive behavior. Our analyses controlled for student age, as research suggests that peer influence susceptibility increases from childhood to mid adolescence (e.g., Jang, 1999). Students' gender was also controlled for, given that gender differences in peer influence susceptibility have been found for certain behaviors (e.g., Giletta et al., 2012; Müller, Hofmann, & Arm, 2017).

Method

Participants

The data for this study were collected in Swiss special needs schools for students with ID. In Switzerland, special needs schools exist in parallel to inclusive classrooms. No national data is available on the distribution of students with ID who attend special needs schools or inclusive classrooms. However, due to similarities in school systems and prevalence rates of special needs support, the situation is likely comparable to Germany, where 86.6% of all students with ID attend special needs schools (Bundesamt für Statistik, 2019; Kultusministerkonferenz, 2020). Special needs schools in the local school system provide classrooms for students with ID from childhood until adolescence, in which they spend their entire school day (typically from about 8 am to 4 pm). These schools can only be attended when a student receives a clinical diagnosis of ID (in practice, rare exceptions do occur). Diagnoses are usually based on ICD-10 criteria and include an assessment of intelligence ($IQ < 70$) and a clinical estimation of adaptive behavior levels. Students are assigned to lower grade (Kindergarten to Grade 2), middle grade (Grades 3–6), and upper grade (Grades 7–10) classrooms depending on their chronological age. While there are no additional formal rules for classroom assignment, informal reports by administrators at the participating schools suggested that combining students with very low adaptive competences or many behavioral problems in the same classroom is typically avoided.

We contacted 20 headmasters of special needs schools in the German-speaking part of Switzerland; 16 agreed to participate (for details, see below). Of the participating schools, 68.75% were in urban areas, 12.5% in peri-urban areas, and 18.75% in rural regions. The average number of students per school was 80.05 ($SD = 23.64$, range = 28–121); classrooms contained on average 6.64 students ($SD = 1.72$, range = 4–15). The mean age of the students at T1 was 11.30 years ($SD = 3.75$, range = 4.17–19.08); 69% were male. Information about students was provided by 379 school staff members (T1: 75.4% women; $M_{age} = 46.77$ years, $SD = 11.09$, range = 17–66). Most respondents had a special needs teaching diploma (61.5%); the remainder were regular teachers who provided instruction in specific school subjects, therapists, social workers, or long-time teaching trainees. Participating staff members reported on $M = 2.95$ students ($SD = 1.71$, range = 1–8) whom they supervised daily at school. In total, the sample included 1125 children and adolescents (out of 1177 students total) who attended 179 classrooms (of 182 classrooms total) in 16 special needs schools. Thus, our sample is comprised of 95.58% of all students in the participating schools. Information on the remaining students was not available due to decisions by parents or staff not to participate. T1 measures were assessed between September and October 2018, T2 measures between April and June, 2019. Assessments were conducted in German.

Measures

Demographics

School staff members reported students' gender and age in months.

Individual adaptive behavior

Individual student levels of adaptive behavior at T1 and T2 were assessed by school staff, using a German version of the Adaptive Behavior Assessment System-3 for teachers (ABAS-3; Bienenstein, Döpfner, & Sinzig, 2017). The ABAS-3, originally developed by Harrison and Oakland (2015), is a well-established instrument to assess ID that includes 174 items describing adaptive competences. The ability to perform these competences is rated from 0 (*not able to do this behavior*) to 3 (*always or almost always when needed*). The instrument assesses the three domains of conceptual, social, and practical adaptive behaviors across different subscales (for an overview, see Table 1). The subscale-scores are summed to an overall score for each domain. Reference norms are based on a representative sample of 1896 persons from the general US population and allow for categorization of raw scores according to problem severity. The ABAS-questionnaire has been translated into several languages and has shown adequate reliability and validity in various studies across different countries, including, among others, the US, Oman, Romania, Switzerland, and Taiwan (e.g.,

Table 1
Domains of adaptive behaviors as measured by ABAS-3 (Harrison & Oakland, 2015).

Domain	Subscale	Exemplary items
Conceptual	Communication	"Uses sentences with a noun and verb"
	Functional academics	"Reads his or her name when printed"
	Self-direction	"Controls feelings when not getting his or her own way"
Social	Leisure	"Participates with others in a game or other activity without needing encouragement"
	Social behavior	"Stands a comfortable distance from others during conversations (not too close)"
Practical	Self-care	"Fastens and straightens clothing before leaving restroom"
	Health and safety	"Stays with class during field trips without wandering away"
	School living	"Puts books and supplies in their proper places when finished using them"
	Community use	"Finds the restroom at school by himself or herself"

interrater reliability $r = 0.72\text{--}0.81$; Cronbach $\alpha = 0.86\text{--}0.95$; Emam, Al-Sulaimani, Omara, & Al-Nabhany, 2019; Harrison & Oakland, 2015; Oakland, Iliescu, Chen, & Chen, 2013; Zurbriggen & Orthmann Bless, 2017). In the present data Cronbach α for the scales ranged between 0.94 and 0.98 at T1 and T2. For the current analyses we used the raw scores of the individual adaptive behavior levels for each domain. Higher scores indicated greater competences.

Classroom-level adaptive behaviors

Similar to other studies on classroom peer effects, we calculated the level of adaptive behaviors for each classroom at T1 as the mean of all students' individual ABAS-3-scores at T1. Individual T1 scores were control variables in the analyses predicting individual adaptive behavior at T2 (see, e.g., Araos et al., 2014).

Procedure

The study was approved by the Institutional Review Board of the Department of Special Education at the University of Fribourg. All assessments were anonymous. At no point were the names of students, parents, or teachers provided to the researchers. Before the assessment, parents received a letter from the school informing them of the nature of the study and the anonymity guaranteed to them and their child. The letter emphasized that no medical diagnoses would be provided to the researchers. Parents were informed that participation was voluntary and that they were free to stop participation at any time (in which case staff did not fill out questionnaires for their child). The letter was translated into the nine most frequently used languages in Switzerland. School staff was also informed of the nature of the study and could decline to participate at any time.

Statistical analyses

Preliminary analyses examined the general levels of adaptive behavior in the sample and compared them to the ABAS-3 reference norms (i.e., percentile ranks). In subsequent analyses, the mean raw scores of adaptive behaviors were used. Dependent sample t -tests were conducted to test whether students' adaptive behavior scores changed significantly from the beginning (T1) to the end of the school year (T2). In addition, we calculated correlations between all main study variables.

To answer our research question, we conducted multilevel analyses in Mplus Version 8.0 (Muthén & Muthén, 2017). To account for the hierarchical structure of the data (students nested within classrooms), we modeled students at Level 1 and classrooms at Level 2. Failure to do so could have led to underestimating standard errors and biased significance tests (Raudenbush & Bryk, 2002). We allowed the intercepts to vary at Level 1 (students) and Level 2 (classrooms). For each domain of adaptive behavior, we predicted the individual score at T2 from the classroom mean at T1, controlling for the individual score at T1, gender, and age. We used maximum likelihood estimates with robust standard errors for non-normality and non-independence of observations (MLR; Muthén & Muthén, 2017).

Results

Preliminary analyses

The general levels of adaptive behavior in the sample were low but heterogeneous (T1: $M = PR\ 7.94$; $SD = 11.46$; $Med = PR\ 3$; range = 0–91). According to the ABAS-3 reference norms, 47.2% of participating students had extremely low, 20.5% low, 22.8% below average, and 9.5% at least average adaptive competences. The means for adaptive behaviors at T1 (range 0–3) were 1.40 ($SD = 0.74$; range = 0–2.98) for the conceptual domain, 1.73 ($SD = 0.68$; range = 0–3) for the social domain, and 1.84 ($SD = 0.73$; range = 0–2.99) for the practical domain. t -tests indicated significant increases in competence across the school year for

the conceptual domain ($t(1031) = -5.60$, $p < .001$) and the social domain ($t(1031) = -3.90$, $p < .001$), but not for the practical domain ($t(1031) = -1.70$, $p = .090$).

Table 2 shows the correlations between all main study variables. The correlations between individual adaptive behaviors at T1 and T2, and between the classroom-level adaptive behaviors at T1 were significant and large. These variables also correlated significantly with age (medium to large effect size), indicating that older students exhibited higher levels of adaptive behaviors. Male gender was related to significantly lower scores in the social domain (very small effect size).

Unconditional models

An unconditional model without predictors was tested first to examine the variance of individual adaptive behavior at Levels 1 and 2, as well as the intraclass correlations (ICC). There was significant variance for conceptual skills at Level 1 ($B = 0.283$, $SE = 0.017$, $p < .001$) and at Level 2 ($B = 0.308$, $SE = 0.028$, $p < .001$), for social skills at Level 1 ($B = 0.308$, $SE = 0.020$, $p < .001$) and Level 2 ($B = 0.166$, $SE = 0.025$, $p < .001$), and for practical skills at Level 1 ($B = 0.272$, $SE = 0.020$, $p < .001$) and Level 2 ($B = 0.294$, $SE = 0.032$, $p < .001$). The ICCs indicated that the variance between classrooms was 52.1% for conceptual skills, 35.1% for social skills, and 52.0% for practical skills. One explanation for this considerable variation may be that classrooms of older students (i.e., higher grades) had higher average levels of adaptive behavior (see also the correlations between individual and classroom-level competences and age in Table 2).

Conditional models

To assess classroom peer effects, we analyzed whether T2 individual scores of adaptive behaviors in the conceptual, social, and practical domains were predicted by the T1 classroom mean of the respective domain, controlling for individual score at T1, gender, and age (see Table 3). The main models revealed a significant effect of classroom peer context for conceptual competences (Model 1), but not for social and practical competences (Models 2 and 3). This means that higher levels of conceptual competences in classrooms at the beginning of the school year were related to greater individual increases in conceptual competences over the school year. The standardized coefficient of the classroom peer effect showed a medium effect size ($\beta = 0.312$; Cohen, 1988).

To further evaluate the stability and generalizability of the classroom peer effect in the conceptual domain, sensitivity analyses were conducted. We assessed whether the peer effect depended on classroom characteristics related to potentially ability-dependent student assignments in specific classrooms. Two analyses were carried out for this purpose. First, we examined whether the classroom peer effect was more pronounced in classes with high levels of conceptual competence than in classes with low levels of conceptual competence, based on a median split. That is, we examined whether the peer effect of Model 1 interacted with classroom competence level (high vs. low). The interaction was not significant ($B = 0.034$, $SE = 0.032$, $p = .282$), indicating that the peer effect was the same for classes with high and low levels of conceptual competence.

Second, we examined the heterogeneity of conceptual competence within classrooms as a moderator. Heterogeneity was operationalized as the within-classroom standard deviation of conceptual competence. This interaction was also not significant ($B = 0.126$, $SE = 0.119$, $p = .289$), indicating that the effect of classroom conceptual competence on individual competence development did not depend on the degree of heterogeneity of competence-levels within the classroom.

Finally, we tested whether the classroom peer effect in the conceptual domain was moderated by age or gender. No significant interactions were found with age ($B = 0.002$, $SE = 0.006$, $p = .749$) or gender ($B = -0.040$, $B = 0.031$, $p = .200$). There were also no moderator effects for social and practical competences ($p > .05$).

Table 2
Correlations between the key variables.

	1	2	3	4	5	6	7	8	9	10	11
1. T1 individual conceptual domain	–	0.851**	0.930**	0.923**	0.787**	0.872**	0.770**	0.678**	0.742**	0.541**	–0.031
2. T1 individual social domain		–	0.881**	0.795**	0.855**	0.812**	0.597**	0.678**	0.623**	0.364**	–0.071*
3. T1 individual practical domain			–	0.875**	0.815**	0.915**	0.740**	0.706**	0.768**	0.507**	–0.034
4. T2 individual conceptual domain				–	0.865**	0.936**	0.733**	0.648**	0.711**	0.520**	–0.032
5. T2 individual social domain					–	0.893**	0.564**	0.597**	0.583**	0.349**	–0.047
6. T2 individual practical domain						–	0.707**	0.656**	0.722**	0.495**	–0.023
7. T1 classroom-level conceptual domain							–	0.881**	0.964**	0.690**	–0.036
8. T1 classroom-level social domain								–	0.919**	0.532**	–0.060*
9. T1 classroom-level practical domain									–	0.645**	–0.030
10. T1 age										–	–0.039
11. Male gender (reference female)											–

* $p < .05$; ** $p < .01$.

Table 3
Random intercept models for the prediction of individual adaptive behaviors at T2 by T1 classroom-level (Mean) adaptive behavior, controlling for T1 individual adaptive behavior, gender, and age.

Parameters	Model 1: Conceptual Domain				Model 2: Social Domain				Model 3: Practical Domain			
	<i>B</i>	<i>SE</i>	<i>p</i>	β	<i>B</i>	<i>SE</i>	<i>p</i>	β	<i>B</i>	<i>SE</i>	<i>p</i>	β
Fixed Effects												
Intercept	0.055	0.051	0.280	–	0.183	0.077	0.017	–	0.038	0.067	0.567	–
Classroom adaptive behavior ^a	0.093	0.035	0.008	0.312	0.031	0.042	0.459	0.080	0.041	0.040	0.312	0.124
Individual T1 behavior ^a	0.908	0.017	<0.001	0.945	0.831	0.021	<0.001	0.867	0.908	0.018	<0.001	0.928
Male gender	0.008	0.020	0.672	0.005	0.018	0.024	0.465	0.013	0.011	0.018	0.538	0.007
Age	–0.001	0.004	0.748	–0.007	0.007	0.004	0.077	0.042	0.005	0.004	0.208	0.028
Variance Components												
Level 1	0.058	0.005	<0.001	–	0.096	0.007	<0.001	–	0.057	0.004	<0.001	–
Level 2	0.026	0.005	<0.001	–	0.032	0.010	0.002	–	0.033	0.006	<0.001	–

^a Relating to the adaptive behavior domain considered in each model.

Discussion

The goal of this study was to examine whether the classroom peer context in special needs schools influences individual development of adaptive behavior for children and adolescents with ID. We found a classroom peer effect for conceptual competence development across the school year, but not for the development of social and practical competences.

In order to adequately interpret our results, it is important to first consider the levels of and changes in students' adaptive behaviors. Most students had very low levels of adaptive competences at the start of the school year, but increased significantly in conceptual and social competences over time. This overall positive development was supported by positive correlations between age and adaptive skills. While a substantial part of these changes may be explained by individual and contextual factors that generally affect student development, we sought to determine the specific role of the classroom peer context. We found that greater levels of classmates' conceptual competences (relating to functional academics, self-direction, and communication) predicted individual increases in such competences. The classroom peer context effect was moderate in size and mostly universal, in that it did not depend on other characteristics, such as skill level distribution within classrooms, or on students' age or gender. Effect sizes of compositional effects are difficult to compare between studies, given the great heterogeneity of research designs, analysis methods, and covariates used (see discussion in Dumont et al., 2013). It is therefore not possible to conclude whether the peer effect in this study was greater or smaller than that found among typically developing students (no such studies exist for students with ID). It should be noted, however, that even small compositional effects, when working throughout a child's entire school career, can add up considerably (van Ewijk & Sleegers, 2010).

The evidence of a classroom peer effect in the conceptual domain corresponds with findings for typically developing children and adolescents, for whom higher classroom levels of academic achievement

benefit individual academic competence development (see Dumont et al., 2013). With regard to the conceptual competence self-direction, our results for students with ID match findings showing that typically developing students increase more in executive functioning when in classrooms with higher mean levels of these skills (Finch et al., 2019). Similarly, the classroom peer effects for basic communication skills observed in this study are in line with research showing that peers' expressive language skills made a unique contribution to typically developing preschoolers' receptive and expressive language achievement (Mashburn et al., 2009).

In general, our results for the conceptual domain suggest that students with ID are able to integrate information about classmates' competence levels and can benefit from this information in their own skill development. This corresponds with findings on ID from experimental studies showing imitation skills and peer influence susceptibility in other domains, such as risk-taking and social judgments (e.g., Bexkens et al., 2018; Egger et al., 2021; Wagemaker et al., 2020). In contrast to these earlier studies, the present sample was very diverse in terms of the levels of functioning, as it included many students with profound difficulties. Our study further extends earlier research on ID by focusing on natural peer socialization processes over longer time periods. While there is evidence of positive peer intervention effects on adaptive behavior in ID (Carter, 2018), our results suggest that peer learning processes also occur outside of interventions (which in no way precludes that additional interventions may be very useful).

The mechanisms underlying the classroom peer effect on conceptual skills in students with ID must remain open at this point. It can be expected that being among more skilled classmates provides students opportunities for social learning, positive reinforcement, and thematic exchange with each other. For example, benefits that students may derive from classmates who have higher communication skills than their own include imitation, experiences of own successful communication with peers, and increased opportunities for practice in daily interaction at school (see also, Mashburn et al., 2009). In addition, higher levels of

conceptual competences in a class may set a group norm that serves as a reference for students and thereby promotes their own learning engagement. Indirectly, it is also possible that teachers adapt to higher mean classroom competence levels in a manner that also benefits students with fewer skills (for an overview, see [Harris, 2010](#)). Future research will need to address the mechanisms underlying classroom peer effects among students with ID.

There was no classroom peer effect for the social domain (relating to leisure and social behavior) and the practical domain (self-care, health and safety, school living and community use) of adaptive behaviors. These peer competences may be less visible and salient in the classroom setting than conceptual skills and may be acquired primarily in dyadic relationships. For example, leisure behavior, as measured by the ABAS-3 ([Harrison & Oakland, 2015](#)), often refers to behavior during school breaks, during which students in special needs schools may spend time with peers outside of their small classrooms. Classmates' leisure behavior may therefore be less observable to individual students, and it may instead be that the behavior of friends from other classrooms plays a more important role. Similarly, some self-care behaviors are not observable in the classroom setting (e.g., uses the restroom independently). Furthermore, certain behaviors, such as those regarding the school living domain (e.g., keeps books neat and clean), may be less salient for students when observing their peers so that relatively less influence occurs. Overall, the finding that classmates' characteristics have an effect on conceptual, but not on social and practical competences, remains difficult to explain. An important direction for future research is to increase differentiation within the adaptive behavior domains, as peer effects may only concern specific aspects of competence development in ID.

Implications

Our results have several implications. In terms of conceptual skill development, our findings suggest that students with ID in special needs classrooms influence each other's competence development through everyday peer socialization. This influence from the peer context is remarkable given that many students with ID experience considerable intellectual and adaptive difficulties that impede observation and learning from their environment. When considering our results from a strength-oriented view, the ability to benefit from peer characteristics outside of interventions indicates a crucial competence of children and adolescents with ID. Although the literature has primarily focused on the important effects of individual, parental, and professionals' characteristics on adaptive behavior in ID, our results suggest that this research should be extended to include the peer context and even interactions with other sources of influence. This will serve a deeper theoretical understanding of adaptive development in ID and could provide further perspectives on ways to support children and adolescents with ID.

In terms of practical implications, our results suggest intentionally composing special needs classrooms to provide opportunities for positive peer learning. A goal could be to assign students to classrooms in which they can interact with peers who have superior competence to them in certain skill areas. As students with special needs differ considerably in their profile of individual strengths and weaknesses of adaptive competences (e.g., [Ditterline, Banner, Oakland, & Becton, 2008](#)), such a strategy may be also feasible in special needs classrooms where general skill levels are low. Given that special needs classrooms often are small, it may further be important to foster peer interactions across classrooms or even schools, creating varied opportunities for peer learning for students of all competence levels.

Besides of decisions on classroom composition, teachers have many opportunities to foster social learning among peers through promoting positive peer relations and create opportunities for interaction within the classroom (see [Farmer, Hamm, Dawes, Barko-Alva, & Riedl Cross, 2019](#)). For example, changing seating positions in the classroom based on social status and behavior influences students' social embedding

among their peers ([van den Berg & Stoltz, 2018](#)) and may lead to new interaction patterns and opportunities for social learning. More research is needed to understand whether such peer group-focused classroom arrangements by teachers (sometimes metaphorically referred to as teachers' "invisible hand"; [Farmer, McAuliffe Lines, & Hamm, 2011](#)) affect the development of adaptive behavior in students with ID.

Strengths, limitations, and future perspectives

To our knowledge, the current study is the first to investigate classroom-level peer effects on adaptive behavior development for students with ID. In light of the relatively low prevalence of ID, one study strength was the large sample of students with ID who were followed longitudinally and assessed using standardized measurement instruments. This allowed for the inclusion of sufficient level 2-units (classrooms) for classroom effects to be reliably measured (i.e., $n > 50$; [Maas & Hox, 2005](#)). The high participation rate per school also allowed for sound determination of classroom peer effects.

This study also had some limitations. One was the reliance on staff reports alone when assessing students' adaptive behaviors. We chose staff reports because they are a reliable and valid measure of adaptive behavior in ID (e.g., [Harrison & Oakland, 2015](#)), and their use made it possible to assess a large sample in an effective manner. This procedure also avoided the exclusion of more severely handicapped students from the sample who would not have been able to provide self-reports or complete standardized performance tests. Nevertheless, additional use of individual testing, or parent-, peer-, and/or self-reports would have further increased the reliability of our results. Future research could also use observational methods to shed additional light on the mechanisms underlying peer effects. Such studies could apply in-depth quantitative and qualitative analyses of specific interaction patterns during which classroom peer influence on adaptive behavior is observed among students with ID.

A question that is always important in studies assessing classroom-level peer effects is how the use of systematic classroom assignments by students' abilities might influence study results. Although our sensitivity analyses gave no indication that the strength of the peer effect differed across classrooms varying in level or heterogeneity of students' competence, future research should pay special attention to this issue. For example, the literature still lacks studies that investigate how students with ID are typically assigned to different age-equivalent classrooms based on their own and their peers' characteristics.

The current study focused on special needs schools; similar research should be conducted in inclusive classrooms, as in several countries many students with ID attend mainstream schools. The differences between the adaptive competences of students with ID and their classroom peers are often greater in these settings than within special needs classrooms. It is important to understand the ways in which this differential affects peer influence susceptibility.

In conclusion, the results from the present study extend our knowledge on the factors that influence adaptive behavior development in children and adolescents with ID. These insights can stimulate further research on the role of peer influence in competence development, and the ways in which the socializing force of peers can be used positively to support students with ID.

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