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Challenging behaviour in students with intellectual disabilities: the role of individual and classmates' communication skills

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Abstract

Background Children and adolescents with intellectual disabilities (ID) are at increased risk of developing challenging behaviour. Challenging behaviour may be partially explained by low individual communicative competences. However, communication involves at least two partners, thus outcomes may also vary according to each interaction partners' abilities. We therefore investigated the degree to which the interplay between individual and classmates' communication skills predicts changes in challenging behaviour among students with ID.
Methods This study used a longitudinal design with two measurement points across one school year. Challenging behaviour and communication skills were measured by teacher reports in 1125 students with ID attending special needs schools. Applying a multilevel approach, we investigated (1) whether higher individual communication skills at the first measurement were related to a subsequent decrease in challenging behaviour and (2) whether this effect was moderated by classmates' levels of communication skills. In addition, we examined (3) if classroom communication skills were indirectly related to a decrease in challenging behaviour by influencing individual communicative abilities.
Results Higher individual communication skills at the first measurement were significantly related to a decrease in general challenging behaviour over the school year. This effect was not moderated by classroom-level communication skills. However, classmates' communication skills exerted an indirect influence by enhancing individual communicative abilities. Further analyses suggested classroom contextual effects related to a decrease in several sub-domains of challenging behaviour.
Conclusions The study results suggest that both individual communicative competences and those of the classroom context are relevant to understanding challenging behaviour development in ID. Perspectives for counteracting such behaviour in light of the present findings are discussed.

Keywords challenging behaviour, classroom context, communication, intellectual disability, social learning, special education

Introduction

Children and adolescents with intellectual disabilities (ID) are at increased risk of developing challenging

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behaviours (e.g. Kurtz *et al.* 2020; Esteves *et al.* 2021). Challenging behaviour is defined as 'Culturally abnormal behaviour(s) of such an intensity, frequency or duration that the physical safety of the person or others is likely to be placed in serious jeopardy, or behaviour which is likely to seriously limit use of, or result in the person being denied access to, ordinary community facilities' (Emerson and Bromley 1995). Such behaviour can be associated with decreased social inclusion among peers and often poses challenges for other people in the social environment, including parents, caretakers and teachers (e.g. Tomanik *et al.* 2004; Brunsting *et al.* 2014; Amstad and Müller 2020). In special needs schools, which are attended only by children with ID, such problems are particularly pronounced (e.g. Dworschak *et al.* 2016).

Several explanations for challenging behaviours relate to individual factors associated with ID. Individuals with ID exhibit difficulties in intellectual functioning and adaptive behaviour competences (i.e. conceptual, social and practical skills) that are at least two standard deviations below the population mean (American Association on Intellectual and Developmental Disabilities 2021). The severeness of individual intellectual and adaptive functioning problems, as well as the presence of specific genetic syndromes, are factors associated with the degree of problem behaviour exhibited (e.g. McClintock *et al.* 2003; Emerson and Einfeld 2011; Esteves *et al.* 2021). However, the social environment can also play an important role: for example, positive and negative reinforcement in interactions with adults as well as social influence among peers both contribute to the development of behavioural problems among children and adolescents with ID (e.g. Petscher *et al.* 2009; Emerson and Einfeld 2011; Matson *et al.* 2011; Bexkens and Müller 2021). Communication skills represent a factor that may affect challenging behaviour on both an individual and contextual level. Studies have shown that low individual communicative competences are related to increased challenging behaviour over time (Hollo *et al.* 2013; Chow 2018). Given communication takes places in social situations (Argyle 2007), the communicative social context (i.e. the communication behaviour of interaction partners) also influences successful communication (Hatton 1998). In this regard, earlier research often focused on communicative processes between individuals with ID and their caregivers (e.g. Kaiser and Blair 1987; Davis *et al.* 1988; Kasari *et al.* 1988; Gabor *et al.* 2016). Less is known about whether and how the communicative context of same-aged peers, such as classmates, affects communication skills and challenging behaviour at an individual level. Thus, it is important to investigate the interplay between an individual's communication skills and the communicative skills of their classmates in explaining challenging behaviour among students with ID.

Challenging behaviour and communication skills in children and adolescents with intellectual disability

Challenging behaviours in different behavioural domains, such as social and attention difficulties, self-absorbed and stereotypical behaviour, aggressive behaviour, withdrawal, and anxiety, are more frequently observed in children and adolescents with ID than in the general population (e.g. Dekker, Koot, *et al.* 2002; Einfeld *et al.* 2011; Marrus and Hall 2017).

An important factor related to the development of challenging behaviour is low communicative competence (Hollo *et al.* 2013; Chow 2018). Most children with ID exhibit delayed language development, which often persists into adolescence and adulthood (Memisevic and Hadzic 2013; Marrus and Hall 2017). These language development delays relate to both linguistic skills (e.g. phonology, vocabulary and grammar) and communicative-pragmatic skills. Communicative-pragmatic skills are 'the competence as to when to speak, when not, and as to what to talk about with whom, when, where, in what manner' (Hymes 1972). The latter competences are assumed to be particularly important for social interaction (Hatton 1998). A recent study by Diken (2019) compared students with mild ID with typically developing students and found that nearly 80% of those with ID had below average, poor or very poor communication skills.

Among individuals without ID, there is strong evidence that poor communication skills are associated with more challenging behaviour (Hollo *et al.* 2013; Yew and O'Kearney 2013; Law *et al.* 2014). Further, for children and adolescents

with ID, studies suggest communicative and behavioural difficulties often co-occur (Dekker, Koot, *et al.* 2002). Although a substantial part of challenging behaviour in individuals with ID can be explained by general developmental delays, the inability to verbally express needs, intentions and feelings may also lead to frustration and thus to behavioural problems (Marrus and Hall 2017).

Relationship between classmates' communication skills and individual challenging behaviour

Based on a bioecological view of development (e.g., Bronfenbrenner and Ceci 1994; Lundqvist and Sandström 2019), both a child's own biosystem (i.e., age, character, talents and disabilities) and the contextual systems around them are important for individual development, where the school context is referred to as a developmentally relevant microsystem. Within this system, communicative situations arise when individuals interact with each other (Argyle 2007). Successful communication is dependent on both individual communication skills and the interaction partner's communicative behaviour (Hatton 1998). It can thus be expected that the higher the communicative competence of interaction partners, the greater the chance that individuals with communication problems can express themselves and be understood adequately. More successful communication between partners can thus be expected to result in less challenging behaviours in individuals with low communication skills, as their needs are better expressed and better understood by their interaction partners. In this way, frustration and feelings of helplessness might be reduced. This assumption is supported by a meta-analysis by Walker and Snell (2013), who showed that behavioural problems decreased when adults adapted to the communicative problems of persons with disabilities by helping them use augmentative and alternative communication means during social interactions. Similar processes may be assumed between peers at school: in classrooms with a higher mean communication competence among students, an individual student's lower communication skills might have diminished effect on challenging behaviour development, due to (partial) compensation for individual difficulties by peers (e.g. peers ask for clarification and provide help). To the best of our knowledge, earlier research has not yet addressed these processes among students with ID in special needs schools.

In addition, classmates might provide a context for social learning of communicative competence (e.g. Bandura and Walters 1963; Akers and Jennings 2009). That is, individual students improve their communicative skills by learning through imitation and positive reinforcement from linguistically competent peers. The resulting improvement in individual competences might then, in turn, be related to less challenging behaviour over time. Linguistic research supports the assumption that social contexts where individuals are surrounded by competent communication partners provide an important base for observational learning and communicative skills practice (Black and Logan 1995; Pellegrini *et al.* 2002; Onnis *et al.* 2018). Although there is a lack of research regarding classmates' influence on communication skills among students with ID, some indications for social learning can be found in studies on typically developing students or on other behavioural domains. For example, Mashburn *et al.* (2009) found that in typically developing pre-kindergarten children, peers' expressive language abilities were positively related to a child's individual expressive and receptive language development. Regarding students with ID in special needs schools, evidence suggests they are generally susceptible to social reinforcement (Oliver *et al.* 2005; Lloyd and Kennedy 2014), a process that plays an important role in developing communicative skills (Pellegrini *et al.* 2002). Further, studies provide evidence that individuals with ID are susceptible to peer influence with regard to social judgements, risk-taking and challenging behaviours (Asscher *et al.* 2012; Bexkens *et al.* 2019; Wagemaker *et al.* 2020; Egger *et al.* 2021; Müller *et al.* 2021; for an overview, refer to Bexkens and Müller 2021) and that they benefit from peer-mediated interventions on communication skills (e.g. Biggs *et al.* 2018). However, the extent to which the communication skills of students with ID are influenced by classmates' competence in daily interaction processes, and the degree to which this affects the development of challenging behaviour, has not yet been clarified.

The present study

The present study sought to better understand the ways in which individual and classmates' communicative skills are related in the prediction of challenging behaviour among students with ID. We examined this issue with a focus on classrooms in special needs schools, which are attended solely by students with ID. Special needs schools are a predominant school type for these students in many countries. For example, in Germany, 86% of students with ID attend special needs schools (Kultusministerkonferenz 2021). Although the Swiss education system, where this study took place, lacks a specific school administrative category for ID, extrapolations from various statistical reports suggest similar numbers for Switzerland (Müller *et al.* 2020). Overall, in the 2018–2019 school year, 1.4% of the entire Swiss student population attended a special needs classroom in a regular school, and 1.8% attended a special needs school (Federal Statistical Office 2020).

Using a longitudinal observational study with two measurement points over one school year, we first investigated how students' individual communication skills are related to changes in their challenging behaviour over time. On the basis of the research indicating low communication skills contribute to more challenging behaviours (e.g. Marrus and Hall 2017), we expected lower skills at baseline to be associated with elevated future challenging behaviour (controlling for students' earlier challenging behaviour; Hypothesis 1). We then tested a moderating effect of classmates' communication skills, assuming the effect of lower individual communication skills on the development of more challenging behaviour is diminished by a higher level of communicative abilities in the classroom (Hypothesis 2). Following the assumption that individual student communication development is influenced by classmates' competences, we then examined whether there was an indirect effect of classroom communicative skills on individual challenging behaviour (Hypothesis 3). We assumed that higher classroom-level communicative competences at the beginning of the school year predict an increase in individual communication skills over time (controlling for earlier individual skills). Higher individual communication skills should in turn be associated with less challenging behaviour. Because student responses to social context can differ by age and sex (Jang 1999; Giletta *et al.* 2012), we controlled for these two variables when testing our hypotheses. We additionally controlled for students' adaptive behaviour level as an indicator of general functioning, because the level of functioning might also play an important role in the development of challenging behaviour (e.g. Dekker, Koot, *et al.* 2002; Esteves *et al.* 2021).

Methods

Participants

To test our hypotheses, we used data from 16 special needs schools in Switzerland. These schools only served children and adolescents with ID and provided all-day care for students. Attendance at these schools requires a clinical diagnosis that meets ICD-10 criteria for ID (World Health Organization 2004). The data were part of a larger research project that examined characteristics and peer relations among students with ID in special needs schools in the German-speaking part of Switzerland (Müller *et al.* 2020). Overall, 1125 students (out of 1177 in total) from 179 classrooms (out of 182 in total) took part in the study, representing a participation rate of 95.58%. Information on the remaining students was not available due to the decision by parents or staff to decline participation in the study. School staff reported on students' characteristics at two measurement points, once at the beginning and once at the end of the school year (T1: September to October 2018, T2: April to June 2019). Of the 1096 students for whom a questionnaire was completed at T1, 1039 also participated at T2.

Students' mean age at the first measurement point was 11.26 years (SD = 3.76; range = 4.17–19.08), and there were more boys (69%) than girls in the sample. Although we did not collect IQ scores to identify the exact severity of each student's ID, assessment of adaptive competences (i.e. one component of ID diagnosis) revealed students were highly heterogeneous in terms of their general functioning. Compared with the reference norms of the Adaptive Behaviour Assessment System-3 for teachers (ABAS-3; Bienstein *et al.* 2018; Harrison and Oakland 2015), 47.2% of participating students had

extremely low, 20.5% low, 22.8% below average and 9.5% had at least average adaptive competences. Of the 379 school staff members reporting on students, 79.1% were class teachers or co-teachers, and 16.2% were other staff, for example subject-specific teachers, assistants, trainees, social pedagogues or therapists (no information was available for 4.7%).

Measures

Challenging behaviour

Challenging behaviour was measured at T1 and T2 using the German version of the Developmental Behaviour Checklist for Teachers (DBC-T; Einfeld *et al.* 2007). The scale consists of 94 items. The instrument's authors used factor analyses to group items into the sub-scales 'Disruptive/antisocial behaviours', 'Self-absorbed behaviours', 'Communication disturbance', 'Anxiety', 'Problems relating socially' and 'Others' (refer to Table 1 for an overview and example items). School staff estimated the occurrence and severity of each behaviour during the last 2 months, using a three-point Likert scale (e.g. 'exhibits repetitive activities'; 0 = *not true*, 1 = *somewhat true or sometimes true*, 2 = *very true or often true*).

Both the original DBC-T English version and the German translation have been thoroughly evaluated in international studies (e.g. Einfeld and Tonge 1995; Dekker, Nunn, *et al.* 2002; Steinhausen and Metzke 2005). The internal consistency of the overall scale, as calculated by the current data, was $\alpha = 0.95$ at T1 and T2. For statistical analyses, item scores were combined to create a mean raw score of challenging behaviour for each student.

Communication skills

School staff reported on students' communication skills using a sub-scale of the ABAS-3 (Harrison and Oakland 2015; Bienstein *et al.* 2018) at T1 and T2. The ABAS-3 sub-scales were derived from theory and validated by factor analyses (Harrison and Oakland 2015). The sub-scale communication skills contains 22 items that assess: linguistic competences, such as naming objects or using correct sentence structures and grammatical markers; basic communication skills, such as greeting people, saying yes and no, and listening to others; and more complex communication skills, such as the ability to hold longer conversations on specific topics [e.g. 'speaks to others for at least 10 min about complex topics (e.g. politics or current events)']. The questionnaire also includes items regarding the use of non-verbal forms of communication, such as gestures and facial expressions. Teachers, staff and other professionals used a 4-point response scale to indicate whether, and how frequently, an individual student performed each communicative activity (0 = *the student is not able to exhibit the activity*; 3 = *the student always exhibits the activity when required*). There was a high internal consistency across items ($\alpha = 0.97$) at both T1 and T2. Individual communicative skills were determined by the mean raw score of all items. To determine

Table 1 Domains and example items of challenging behaviours of the DBC-T

Domain	Example items
Disruptive/antisocial behaviours	Is impulsive, reacts before thinking; kicks or hits others; steals; is stubborn, disobedient or non-cooperative
Self-absorbed behaviours	Exhibits repetitive movements of hands, body, head or face such as hand waving or swinging; chews or mouths objects or body parts; stares at lights or spinning objects
Communication disturbance	Repeats back what others say like an echo; stands too close to others; talks to him or herself, imaginary persons or objects
Anxiety	Cries easily for no reason or over small things; fears particular things or situations (e.g. the dark, insects); is tense, anxious or worried
Problems relating socially	Appears depressed, down or unhappy; moves slowly, is underactive, does little (e.g. only sits and watches others); is distant, in his or her own world
Others	Covers ears or is distressed when hears particular sounds; sees or hears something that is not there; is disliked by other children

classroom-level communicative skills, all students' mean scores in a classroom were combined to form a classroom mean. Using this mean value to predict a future individual outcome while controlling for earlier individual score allows for testing of classroom contextual effects (Marsh *et al*. 2012).

Control variables

Staff reports were also used to assess students' sex, age and general functioning. General functioning was measured at T1 using the percentile rank (PR) of the ABAS-3 general adaptive composite score, which is composed of 174 adaptive behaviour items and relates to a reference norm of typically developing children and adolescents (Harrison and Oakland 2015).

Procedure

The present study was reviewed and approved for scientific procedure and ethical conduct by the institutional research commission of the Department of Special Education at the University of Fribourg. The commission evaluated the project with reference to the guidelines published by the University of Fribourg, the Ethical Principles of Psychologists and Code of Conduct (American Psychological Association 2017) and the Declaration of Helsinki (World Medical Association 2001). Access to the study subjects was secured via informational letters sent to each special needs school and subsequent personal consultations with the school directors, after which parents were sent letters informing them of the nature of the study. Data collection was completely anonymous, so that the researchers never had access to any names of reporting school staff, parents or students. Numerical codes were used to link data from the two measurement points. Parents were informed by letter that the study was anonymous, no information on medical diagnoses was collected, and participation was voluntary. They were free to inform the class teacher if they did not wish for anonymous information about their child to be provided to the research team.

Data collection took place at the schools. Staff members familiar with the students filled in the paper-pencil questionnaires individually, following an introduction to the questionnaires by a collaborator of the research project. This procedure was conducted at T1 (autumn 2018) and T2 (spring 2019). Because this was not an intervention study, there were no guidelines or restrictions from the research team regarding what kind of support (in terms of behaviour and communication) was allowed or not allowed between the two measurement periods.

Data analyses

Before testing our hypotheses, we performed descriptive analyses to obtain an overall estimate of the means and standard deviations of challenging behaviour and communication skills, as well as PRs of the sample compared with the respective reference norm. The PRs allow for improved contextualization of the problems and competencies of these students. We used the raw mean scores of challenging behaviour and communication skills for inferential statistics to investigate whether absolute levels of challenging behaviour development over time depend on communication skills. Before testing our hypotheses, we estimated correlations to investigate the general relationship between the variables.

For the main analyses, we conducted multilevel modelling using the software Mplus Version 8.0 (Muthén and Muthén 2017). Given the study design had students (Level 1) nested in classrooms (Level 2) and we included classroom-level communication skills in our analyses, this approach was necessary to avoid biased significance tests (Raudenbush and Bryk 2002). Individual challenging behaviour, individual communication skills, sex and age were defined as Level 1 variables, and classroom communication skills as a Level 2 variable. When the communication skills of both individual students and the entire classroom were included in the analyses, individual student scores were centred around the classroom mean (group-mean-centring; Enders and Tofighi 2007; Bell *et al*. 2017) to avoid confounding Levels 1 and 2 effects. We ran random intercept models, where the intercept is allowed to vary across Level 1 units (students) and Level 2 units (classrooms). Using the software Mplus further allowed us to use maximum likelihood parameter estimates with robust standard errors. The robust standard errors approach (Muthén and Muthén 2017) is preferred in case of non-normality and heteroskedasticity in the data, because it provides unbiased estimates, even if assumptions are violated.

We first tested the main effects of individual and classroom communication skills at T1 on individual challenging behaviour at T2, controlling for T1 challenging behaviour, sex and age. Second, we added the interaction term between individual and classroom communication skills to investigate the potential moderating effect of classroom communication skills (refer to Fig. 1). Third, we conducted a two-level mediator analysis to test the indirect effect of classroom communication skills on individual challenging behaviour. We followed the procedure recommended by Rose *et al.* (2004) for testing mediator effects in research designs with two measurement occasions: we first estimated the direct effect of T1 classroom-level communication skills on T2 individual communication skills (mediator), controlling for T1 individual skills (refer to Fig. 2). For the direct effect of individual communicative abilities on challenging behaviour, we used T1 individual abilities to predict T2 challenging behaviour, controlling for T1 challenging behaviour. If both direct effects are significant, then the significance of the indirect effect is tested using the Sobel test (Sobel 1987), which is commonly used in mediator analyses. In further exploratory analyses, we examined whether the same effects are found for the different sub-scales of the DBC-T as for the total challenging behaviour score, or whether effects differ by behavioural domain.

Results

Preliminary analyses

Descriptive statistics provided in Table 2 reveal the mean raw scores of challenging behaviour at T1 (M = 0.38; SD = 0.25) and T2 (M = 0.37; SD = 0.24) using the DBC (scale range 0 to 2). On the basis of these scores, we also calculated the samples' PRs applying the reference norm of this measurement instrument. The mean PR of challenging behaviour at both measurement periods (T1: MPR = 58.68, SD = 26.44; T2: MPR = 58.24, SD = 26.71) indicates that, compared with the DBC's reference norm of same-age individuals with ID in Australia (Einfeld and Tonge 2002), challenging behaviour in the current sample was somewhat elevated. Regarding communication skills measured by ABAS-3, the sample means were 1.62 at T1 and 1.67 at T2, on a scale from 0 to 3. When calculating the PRs based on the instrument's reference norm of typically developing same-age individuals in the US (as determined from the scaled scores used in the ABAS-3; Harrison and Oakland 2015), the mean PR of communication skills

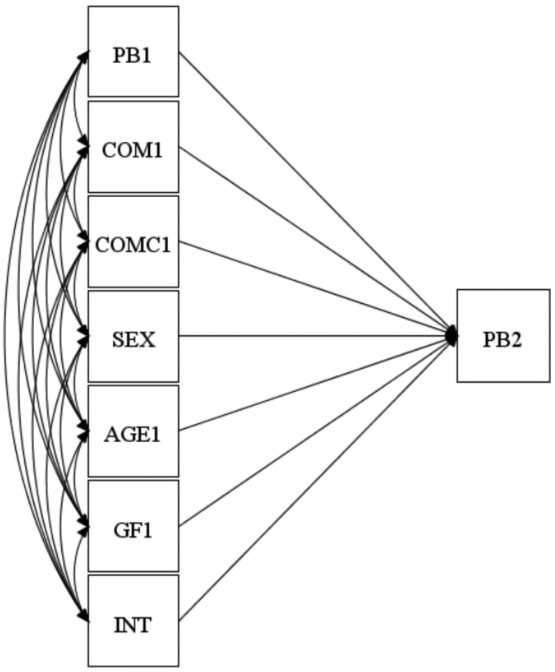

Figure 1. Main effects of and interaction effect (INT) between T1 classroom communication skills (COMC1) and T1 individual communication skills (COM1) on T2 problem behaviour (PB2), controlling for sex, age at T1, and T1 general functioning (GF1)

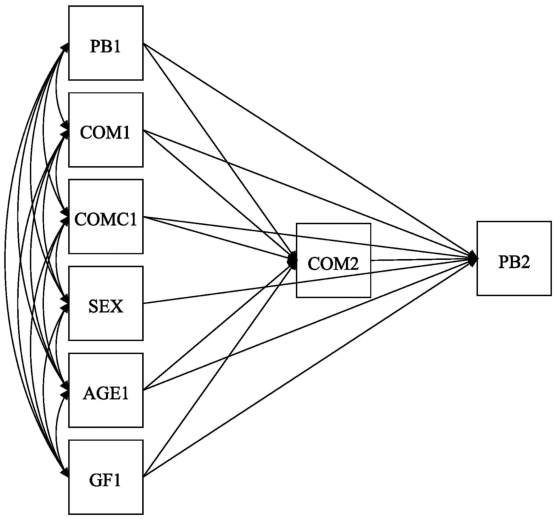

Figure 2. Direct and indirect effects of T1 classroom communication skills (COMC1) and T1 individual communication skills (COM1) on T2 communication skills (COM2) and T2 problem behaviour (PB2), controlling for sex, age at T1, and T1 general functioning (GF1)

of 4.33 at T1 and T2 in the sample indicates competences in the range of more than 1.5 standard deviations below the reference mean.

As further seen in Table 2, there were significant and moderate negative correlations (according to Cohen 1988) in the expected directions between individual communicative abilities and individual challenging behaviour at T1 ($P < 0.01$; $r = -0.440$) and T2 ($P < 0.01$; $r = -0.449$). In addition, significant and large positive correlations were found between classroom communication skills and individual skills at T1 ($P < 0.01$; $r = 0.689$) and T2 ($P < 0.01$; $r = 0.646$) and significant but small negative correlations between classroom communicative skills and individual challenging behaviour at T1 ($P < 0.01$; $r = -0.292$) and T2 ($P < 0.01$; $r = -0.274$). While male sex was related to more challenging behaviour at T1 (small effect; $P < 0.01$; $r = 0.118$) and T2 (small effect; $P < 0.01$; $r = 0.129$), no significant sex differences were found regarding communication skills. Older students exhibited significantly less challenging behaviour at T1 (small effect; $P < 0.01$; $r = -0.174$) and T2 (small effect; $P < 0.01$; $r = -0.170$) and had higher communicative abilities (medium effect). General functioning was negatively related to challenging behaviour at T1 (moderate effect; $P < 0.01$; $r = -0.395$) and T2 (moderate effect; $P < 0.01$; $r = -0.334$) and positively related to individual communication skills at T1 (large effect; $P < 0.01$; $r = 0.583$), T2 (large effect; $P < 0.01$; $r = 0.522$), and to classroom skills (moderate effect; $P < 0.01$; $r = 0.378$). Further, general functioning increased slightly with age (small effect; $P < 0.01$; $r = 0.111$).

Table 2 Descriptive statistics and correlations between variables

Variable		*M* (%)	*SD*	1	2	3	4	5	6	7	8
1	T1 challenging behaviour	0.38	0.25	—	0.775**	−0.440**	−0.424**	−0.292**	0.118**	−0.174**	−0.395**
2	T2 challenging behaviour	0.37	0.24		—	−0.407**	−0.449**	−0.274**	0.129**	−0.170**	−0.334**
3	T1 ind. comm. skills	1.62	0.79			—	0.896**	0.689**	−0.046	0.460**	0.583**
4	T2 ind. comm. skills	1.67	0.81				—	0.646**	−0.041	0.438**	0.522**
5	T1 classroom comm. skills	1.62	0.55					—	−0.042	0.654**	0.378**
6	Male sex	69	—						—	−0.041	−0.058
7	T1 age	11.26	3.76							—	0.111**
8	T1 general functioning (PR)	7.94	11.46								—

Scale range for challenging behaviour: 0–2; scale range for communication skills: 0–3.

**p < .01

Main analyses

Results of the main effects model (refer to Table 3) revealed that greater T1 individual communicative skills were significantly related to a decrease in challenging behaviour at T2 ($P = 0.027$; $\beta = -0.055$), controlling for T1 challenging behaviour, age, sex and general functioning. We therefore accepted Hypothesis 1. No significant main effect of classroom communication skills was observed. Similarly, none was found for sex, age or general functioning. Variance components showed significant variation in challenging behaviour existed between students (Level 1; $P < 0.001$) and between classrooms (Level 2; $P = 0.003$), which was not explained by the predictor variables. When the interaction term was included (refer to moderator effect model in Table 3), results revealed no significant moderation of classroom communication skills ($P = 0.148$; $\beta = 110$). Hence, the effect of individual skills did not diminish depending on higher communication abilities in the classroom, and Hypothesis 2 was rejected. The effects not included in the interaction term did not change their significance when the moderator effect was included.

To test our third hypothesis regarding an indirect effect of classroom communication skills on individual challenging behaviour, we first estimated the direct effect of classroom communicative abilities at T1 on individual communicative abilities at T2, controlling for T1 individual score. The higher the classroom-level communication skills at the beginning of the school year (T1), the greater an individual's skills at the end of the school year (T2; $P < 0.001$; $\beta = 0.938$), controlling for earlier individual ability at T1 (refer to Table 4). In addition, greater T1 individual communication skills were significantly related to less individual challenging behaviour at T2 ($P = 0.029$; $\beta = -0.055$), controlling for T1 challenging behaviour. The Sobel test further indicated a significant indirect effect of classroom communication skills on a decrease in individual students' challenging behaviour ($P = 0.030$; $\beta = -0.052$). We therefore accepted Hypothesis 3.

Further exploratory analyses among the sub-scales of the DBC-T revealed the same individual effects held true for the sub-scales 'Self-absorbed behaviours' ($P < 0.001$; $\beta = -0.105$), 'Communication disturbance' ($P < 0.001$; $\beta = -0.104$) and 'Problems relating socially' ($P < 0.001$; $\beta = -0.114$). As with the total problem score, better T1 individual communication skills were significantly related to less problematic behaviour at T2 in each respective behavioural domain. We also found indirect effects of classroom communication skills on individual behaviour among these three behavioural domains ($P < 0.001$). As with the total problem score, no moderator effects were found. However, in contrast to the total score, significant main effects of classroom competences were found for each of the three sub-scales when the interaction term was not included in the analyses. These effects indicate that

Table 3 Main effects and interaction effect of individual and classroom communication skills on T2 challenging behaviour

	Main effects only				Moderator effect			
Parameters	***B***	***SE***	***P***	***β***	***B***	***SE***	***P***	***β***
Fixed effects								
Intercept	0.128	0.028	<0.001	—	0.128	0.028	<0.001	—
T1 challenging behaviour	0.714	0.032	<0.001	0.760	0.713	0.032	<0.001	0.758
T1 individual communication skills	−0.024	0.011	0.027	−0.055	−0.067	0.031	0.031	−0.155
T1 classroom communication skills	−0.024	0.019	0.212	−0.234	−0.021	0.019	0.265	−0.207
Individual × classroom communication skills	—	—	—	—	0.029	0.020	0.148	0.110
Male sex	0.021	0.011	0.062	0.040	0.020	0.011	0.063	0.040
T1 age	0.000	0.002	0.929	−0.003	0.000	0.002	0.873	−0.006
T1 general functioning	0.000	0.001	0.403	−0.022	−0.001	0.001	0.210	−0.034
Variance components								
Level 1	0.021	0.002	<0.001	—	0.020	0.002	<0.001	—
Level 2	0.003	0.001	0.003	—	0.003	0.001	0.003	—

Table 4 Direct and indirect effects on T2 individual communication skills (mediator) and T2 challenging behaviour

	Effects on T2 individual communication skills				Effects on T2 challenging behaviour			
Parameters	***B***	***SE***	***P***	***β***	***B***	***SE***	***P***	***β***
Fixed effects								
Intercept	0.068	0.068	0.321	—	0.128	0.028	<0.001	—
T1 challenging behaviour	—	—	—	—	0.714	0.032	<0.001	0.759
T1 individual communication skills	0.847	0.023	<0.001	0.808	−0.024	0.011	0.029	−0.055
T1 classroom communication skills	0.924	0.042	<0.001	0.938	−0.023	0.019	0.214	−0.233
Indirect effect[†]	—	—	—	—	−0.022	0.010	0.030	−0.052
Male sex	0.016	0.027	0.548	0.013	0.021	0.011	0.061	0.040
T1 age	0.007	0.006	0.228	0.044	0.000	0.002	0.916	−0.004
T1 general functioning					0.000	0.001	0.405	−0.022
Variance components								
Level 1	0.106	0.009	<0.001	—	0.021	0.002	<0.001	—
Level 2	0.034	0.006	<0.001	—	0.003	0.001	0.003	—

[†]The significance of the indirect effect was tested using the Sobel test.

the higher the communication skills in the classroom at the beginning of the school year, the less self-absorbed behaviour ($P = 0.042$; $\beta = -0.379$), communication disturbance ($P = 0.039$; $\beta = -0.319$), and problems relating socially ($P = 0.013$; $\beta = -0.663$) were exhibited by students at the end of the school year. Neither an individual nor a classroom effect of communication skills was found for the sub-scales 'Disruptive/antisocial behaviours', 'Anxiety' and 'Others'.

Discussion

This study sought to shed light on the interplay between individual and classroom communicative skills in predicting challenging behaviour among students with ID in special needs schools. We first assumed that better individual communication skills at the beginning of the school year would be related to a decrease in challenging behaviour at the end of the school year, whereas lower abilities would be related to an increase in such behaviour. This assumption was supported by the study results, and it corresponds to earlier findings that low communication skills are generally related to more challenging behaviour (Hollo *et al.* 2013; Yew and O'Kearney 2013; Law *et al.* 2014). This relationship held true not only for general challenging behaviour, but also for the sub-domains self-absorbed behaviour, communication disturbance and problems relating socially. One possible explanation for the relationship between individual communicative competences and challenging behaviour is that frustration caused by the inability to express oneself could lead to more behavioural problems in individuals with ID (refer also to Marrus and Hall 2017).

Our second hypothesis, that classroom communication skills have a moderating effect on this relationship, was not confirmed by the present data. We found no evidence that poor individual communication skills are less strongly related to more challenging behaviour when classroom-level communication competences are higher; this was true for both general challenging behaviour and specific behavioural domains. There are several possible reasons for this finding. Of note, the strong influence of T1 individual challenging behaviour on such behaviour at T2 indicates challenging behaviour may be stable to some degree, and thus not easily changed by the social context. Other reasons could relate specifically to students with ID in special needs schools: The level of communication skills in special needs classes is generally lower than in mainstream schools (Memisevic and Hadzic 2013; Marrus and Hall 2017) and may not be sufficient to address the relation between individual communication difficulties and challenging behaviour. Furthermore, the severity of individual communication problems in

this student population could also impede positive influences from the social-communicative context.

However, the lack of a moderating effect does not mean that the social context has no effect on challenging behaviour development. Rather, classmates' higher communicative abilities were related to a domain-specific decrease in individual self-absorbed behaviour, communication disturbance and problems relating socially. Analyses further provided evidence that, in accordance with our third hypothesis, there was an indirect influence of classroom communication skills on general challenging behaviour (as well as on the three abovementioned behavioural domains). That is, classmates' greater communicative abilities were related to a decrease in challenging behaviour, by contributing to better individual communication skills. This might be an indication of social learning processes (Bandura and Walters 1963; Akers and Jennings 2009), which have also been found in earlier studies among typically developing students (e.g. Mashburn *et al*. 2009).

Taken together, our results indicate that greater communicative abilities in the classroom peer context of special needs schools for students with ID are relevant for the development of challenging behaviour in two ways. First, positive peer influence processes appear to contribute to an increase in individual students' own communication skills. These individual skills are then related to less challenging behaviour. Second, classmates' communicative skills are also directly related to less challenging behaviour over time, although only in specific behavioural domains. This second finding suggests that additional mechanisms beyond peer influence on communication skills are at play. In classrooms with higher communicative abilities, it is possible that more activities and stimulation among peers may positively impact individual behaviour. However, this line of reasoning remains speculative, and more research is needed to test such mechanisms. Additionally, the evidence of domain-specific effects for self-absorbed behaviours, relating socially and communication disturbances, but not for disruptive/antisocial behaviours, anxiety and miscellaneous other problems cannot be conclusively explained here. It is possible that behaviours associated with less self-regulation, such as many types of disruptive/antisocial and anxious behaviours, may be difficult to control for students with ID and therefore less influenced by individual and contextual communicative competences.

Study implications

The current study found evidence for a significant role of classroom peer context with regard to communication and challenging behaviour development among students with ID in special needs schools. Students with ID appear to be receptive to their peers' communicative behaviour and to learn from other students in spite of (sometimes severe) cognitive and adaptive difficulties that could complicate social learning. The present results therefore suggest that individual students with lower abilities in special needs schools may benefit from classroom compositions that allow for positive social modelling among peers in the domain of communication (e.g. classrooms with greater mean levels of communicative skills among students). Within the special education context, this might take the form of classrooms composed of students with heterogeneous communicative abilities (and possibly adaptive skills in general), to avoid scenarios where only students with lower functioning levels are grouped together.

In addition, our findings support educational approaches that aim to foster positive social interactions and learning opportunities between students (e.g. Farmer *et al*. 2019). Indirect effects of peers' skills on individual challenging behaviour could potentially be strengthened by fostering students' individual communication skills through peer-mediated interventions (Biggs *et al*. 2018). However, clear conclusions require more research into the degree to which the patterns observed in this study might translate into intervention efficacy. In addition, it must be kept in mind that communication skills represent only one of numerous factors that are relevant in terms of challenging behaviour, including biological, cognitive, but also social–emotional and attachment problems (e.g. Janssen *et al*. 2002).

Strengths, limitations and future directions

This longitudinal study extended the current state of research on the influence of individual and contextual communication skills, focusing on overall challenging behaviour as well as specific domains of challenging

behaviour among students with ID in special needs schools. A strength of the present study was the large sample of students with ID. The high participation rate and the inclusion of students with varying degrees of functioning allowed us to draw conclusions for a broad population of students with ID. However, the large sample size and inclusion of students with more severe ID also required the use of assessments that relied on information provided by school staff and not by students themselves. Although staff reports are considered reliable and valid for assessing communication skills and behavioural problems (Einfeld and Tonge 1995; Harrison and Oakland 2015), additional use of self-reports and performance tasks might benefit future studies. Another limitation relates to the non-experimental design of the study, which does not allow for causal conclusions. We also do not know whether and to what extent school staff fostered communication and behaviour in the participating classrooms. In the future, intervention studies with experimental and control groups could provide important information on the effectiveness of activities in promoting positive social-communicative exchange between students. Further, because a considerable proportion of students with ID attend mainstream schools in some countries, future studies should also be conducted in inclusive settings. Finally, the role of the teacher in fostering positive social interaction opportunities between students remains an important area of inquiry.

In conclusion, the present study improves understanding of the interplay between individual and social-contextual influences in the development of communicative competences and challenging behaviour in students with ID. The processes identified may serve as a starting point for further investigating the socialising role of peers in ID. At the same time, findings might further stimulate reflection on the ways in which the complex relations between individual and contextual influences can be used in intervention programmes and daily school practice for students with ID.

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Conflict of interest

There are no authors' financial and non-financial conflicts of interest.

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Ethics statement

We followed the ethics guidelines for publication.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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