Universiteit Utrecht

Does ability-grouping have impact on the attribution to intelligence in children from 6-11 years old?

Name: Kim de Niet, 7067887

Course: Master's thesis clinical child and adolescent psychology

Supervisor: Jellie Sierksma

Second grader: Anne Margit Reitsema

Date: 11-06-2024

Abstract

Current research predominantly focused on the effect of ability-grouping – categorizing individuals based on competence – on academic performance and self-concept. However, there is lacking research on its impact on the social-cognitive effects in younger children. Theories state that minimal conditions are required to categorize individuals into groups, and that grouping can lead to essentialism. Essentialism is the belief that certain categories have a stable, underlying and inherent essence that defines them, leading to solid and inflexible groupings. Essentialist beliefs may alter the way children perceive and behave towards others. To explore whether ability-grouping provokes essentialists beliefs, thereby affecting children's perceptions of others intelligence, a study was conducted in 123 children (6-11 years old). Participants watched videos of an avatar performing either high or low on a novel test, followed by a question about the avatar's attributed intelligence. This study had a 2 (ability: high vs. low; within-subjects) x 2 (grouping vs. no-grouping; between-subjects) experimental design. Data was analyzed using a linear mixed effects model and non-parametric analysis. Grouping versus not grouping children by performance did not influence the perceived intelligence of the avatar. Children believed the avatar was smarter when it had a high performance on the novel test compared to a low performance, especially in younger children. As the attribution to intelligence may be internalized, future research should identify this process further to prevent negative psychological outcomes (e.g. decreased motivation effort and challenge seeking) to happen.

In the current school system children are often divided into groups based on their academic abilities, otherwise named ability-grouping (Papachristou et al., 2022). Ability-grouping is also known as attainment-grouping or tracking. Ability-grouping aims to enhance a child's school performance by providing instructions adapted to the academic abilities of that child. Ability-groups can be differentiated in several ways, which are not mutually exclusive. The first two types fall under between-class ability-grouping, namely streaming and setting. With streaming students, the children are placed in a certain group which remains the same for all lessons. For instance, by following an VMBO, HAVO or VWO education track. Set students are placed in groups only for certain lessons. For example, by providing an honours program. The third and most prevalent type of ability-grouping at primary schools is within-class ability-grouping. According to this type of ability-grouping students are placed into small groups corresponding with their skill levels (Papachristou et al., 2022). To see whether there are social-cognitive effects of ability-grouping, the current study will explore the following research question: "To what extent does grouping children (6-11 years old) by ability (vs. not grouping) lead children to think that academic success or failure is a result of internal causes?"

Previous research

Previous research has mainly focused on the question if ability-grouping is beneficial for academic achievement. Even though most research looked into the effect of between-class ability-grouping, there is some literature available regarding within-class ability-grouping. A meta-analysis examined the effects of ability-grouping on academic achievement and specified for the effects according to ability level (Steenbergen-Hu et al., 2016). Participants were K-12 children, corresponding with children with secondary education (age 17-18 years old). Ability-groups were compared with non-grouped students in heterogeneous classes. Overall, within-class ability-grouping was beneficial and had a small, significant effect on academic achievement, regardless of initial ability level. Additionally, the effects were strongest in the low-ability groups, followed by the high- and medium-ability-groups. In contrast to these findings were the results of a single empirical study performed in dual-language K-6 schools, corresponding with primary education (age 12 years old). In this study no beneficial effects were found of within-class ability-grouping on academic achievement (Matthews et al., 2013). These studies indicate that the effects of ability-grouping on academic achievement are not conclusive yet.

Another subject which gained attention is the impact of ability-grouping on a child's self-concept. Research suggests that there is a mutual relationship between self-concept and achievement. For example, a lowered mathematical self-concept was considered a precursor for lower academic achievement as, later on, mathematical performances declined (Meece et al., 1982). Another intervention showed improved achievement and self-concept when focusing on improving academic achievement and the student's ability to do so (Marsh et al., 1983). Literature indicates that between-

class ability-grouping may have negative effects on self-concept. However, only little research has focused on the effect of within-class ability-grouping on self-concept. A study examined children in schoolyear 3-5 and the relation between academic self-concept and academic achievement. Even though there were significant differences on self-concept between low-, middle- and high-ability groups, they were unrelated to ability-grouping (MacIntyre & Ireson, 2002).

Previous research has mainly focused on the effect of ability-grouping on academic achievement (Hattie & Anderman, 2013; Steenbergen-Hu et al., 2016) and self-concept (Carlos Núñez et al., 2005; Papachristou et al., 2022). However, the social-cognitive effects of within-class ability-grouping deserve some attention as children may essentialize those groups, which may affect how children perceive themselves and others**.** Additionally, research has been done in older children, whereas ability-grouping is already implemented in primary school. Therefore, research on the effects of ability-grouping in younger age groups is necessary.

Grouping

Even though little is known about the effects of ability-grouping, other kinds of grouping influence the way children perceive themselves and the world. Preschool children already categorize others into groups (Dunham et al., 2011; Rhodes & Mandalaywala, 2017). For example, the concept of in- and out-groups (Brewer, 1991). Children seek a way to develop their social identity (Harter, 1999), among other things by identifying themselves with socially recognizable groups, like gender, race or nationality (Tajfel & Turner, 2004). In this process a distinction develops between similar others (in-group) - the ones promoting connection and interdependency - and dissimilar others (out-group) (Brewer, 1991). By the division of two groups something called intergroup bias may occur. This is a positive attitude towards ones in-group, which might also bias an individual to acquire only positive (instead of both positive and negative) information related to their in-group (Dunham et al., 2011). This happens as the in-group provides a source of self-esteem, which makes individuals more prone to emphasize the positive features associated with the in-group. Consequently, in-group favoritism may occur, which is already seen in children at the age of 3 (Patterson & Bigler, 2006). A study in 5-year old children explored whether a random division of children in groups was sufficient to induce intergroup biases (Dunham et al., 2011). Children were assigned to a novel group based on the colour (red or blue) of a coin a child chose at random. Children received a t-shirt, matching the colour of the coin, which indicated the groups later on. Because of this random division, there were no prior statuses (e.g. winners or losers). This kind of grouping appeared to be enough to create intergroup biases when children had to perform a task. This suggests that minimal conditions are sufficient to categorize groups (minimal group phenomenon), and that this may alter how children perceive themselves and others.

Essentialism

One of the consequences of grouping, is that individuals may essentialize those groups (Rhodes & Mandalaywala, 2017). Essentialism is the belief that certain categories have a stable, underlying and inherent essence or characteristics that defines them (Rhodes & Mandalaywala, 2017). This essence is indicative of the distinction between groups, which makes the group division rather fixed. Furthermore, one of the essentialist beliefs is that due to category membership category-typical properties develop (Rhodes & Mandalaywala, 2017). Studies indicate that the essentialist beliefs due to social grouping develop early in life (age 3-5), independent of cultural context (Rhodes & Mandalaywala, 2017). However, at a young age this grouping is based on simple intrinsic causes, like gender, ethnicity, race, religion and spoken language (Rhodes & Mandalaywala, 2017).

Attribution theory

According to the attribution theory people seek causes to explain certain behaviours or events (Graham, 2020). Three dimensions play a role in the attribution of causes, namely locus, stability and controllability (Graham, 2020). Locus can be based on both internal factors (e.g. personality traits) and external factors (e.g. situational traits). In light of success and failure the internal locus can for example be effort or ability, whereas an external locus can be chance or task difficulty. The second dimension of causes is stability, which depicts whether a cause changes over time or not. Ability is seen as a stable cause, whereas luck, effort or chance are not. The third dimension of causes is controllability, which reflects whether the cause can potentially be influenced by the individual. Ability is mostly classified as not controllable, whereas effort is (Graham, 2020).

Considering ability-grouping, when children are grouped, they will possibly seek an explanation for their membership in a certain group. Children may attribute ability to internal causes, such as intelligence, which is seen as an unchangeable (Graham, 2020). Attributing failure to a lack of ability creates the expectation that failure is chronic, potentially resulting in decreased effort and the onset of self-handicapping and learned helplessness (Graham, 2020; Hallahan, 2020). On the other hand, if children think their success to be chronic, they may avoid the challenges needed for effective learning (MacIntyre & Ireson, 2002). If ability-grouping indirectly enhances these negative psychological outcomes, caution is warranted to the use of ability-grouping.

Hypothesis and current study

Combining the aforementioned theories, grouping children by ability may create a categorization, which promotes internal attributions (e.g. intelligence) for their academic performances. This process is strengthened by essentialism, leading to the beliefs that their abilities are fixed and stable. Children above the age of 4 tend to attribute academic achievement to ability (Muradoglu & Cimpian, 2020).

Therefore, I hypothesize that when ability is grouped, children are more likely to attribute a lack of ability to internal causes (e.g. low performance, because he is not smart), compared to when ability is not grouped. The current study will use third-party inferences, as this topic is considered exploratory since it is relatively new and under-explored. Additionally, a younger age-category will be included exploratory to see if there is an effect of age on the attribution to internal causes.

The hypothesis will be tested by letting children of 6 to 11 years old watch a movie, in which a virtual avatar is either non-grouped or grouped, based on performance on a novel task. Afterwards, children will be asked what the most probable reason for a certain task performance is, so it can be investigated which inferences children make about others.

Method

Participants

The current study collected data from children via a probability sample. The aim was to collect data from a total of at least 114 children, based on an a priori fixed model power-analysis for linear multiple regression with a small effect size = 0.1, α = 0.05 and power = 0.80. A small effect size was chosen as this is an explorative study. The participants needed to attend Dutch primary schools and had to be 6-11 years old. The sample consisted of 123 children between the age of 6 and 11 years old (M_{age} = 8.07, SD_{age} = 1.16). The sample contained 62 boys (M_{age} = 8.06, SD_{age} =1.28) and 61 girls (M_{age} = 8.08, SD_{age} =1.04). A post hoc power-analysis revealed an achieved power of 0.84 (effect size = 0.1, α = 0.05).

Design

This study had a 2 (ability: high vs. low; within-subjects) x 2 (grouping vs. no-grouping; between-subjects) experimental design. The between-subject variable was randomly assigned. The participants had to watch four videos about two different novel tasks (zarpen and kroemen). Several factors were counterbalanced across trials and between variables, namely the place where the avatar was seated in the classroom (in the front or the back), the order of the presented novel task and the name of the ability-groups in the grouping-condition (circle or triangle corresponding to zarpen and butterfly or bird corresponding to kroemen). The gender of the avatar in the videos was matched with the gender of the participants.

Procedure

The experiment was conducted in NEMO science museum and in different primary schools in the Netherlands in the period of the 2nd of April 2024 till 10 May. Beforehand, ethical approval was granted (number 24-0332). Parents of the children filled in a form with personal and demographic information and an informed consent form.

The experiment was individually performed on laptops and the children wore headphones. The experimenter told the children “You are going to watch movies about children at school. After you have seen the video, we will ask you what you think about the child in the movie. For example, if you think that the child is a good learner”. Additionally, the experimenter gave some information about the working mechanism of the sliding scale. This information was explained further during the experiment. The participants watched four distinct videos and answered a question about each video. After participation the children received a certificate and were returned to their classroom. The experiment took approximately 20 minutes per person.

Videos

During the first part of the experiment participants had to watch animated videos about other children performing a novel task (zarpen or kroemen) in Qualtrics. Videos were constructed using the program Vyond. Zarpen and kroemen are novel tasks to prevent for interference of previously known ideas and attributions gained in school about performances on familiar tasks, such as reading, writing and arithmetic. By introducing a novel task, it is possible to isolate for the grouping-effect.

In each video, children saw three groups of four children who were seated at a table in a classroom (Figure 1). On top of this table was a workbook, which was labelled in case the children were in the grouping-condition. The children in the class were having different ethnic origins, created by differences in skin colour, hair and eyes.

Figure 1

General Set-up of the Grouping Condition

Note Grouped condition of the kroemen task

Each video had the same structure and lasted between the 2 minutes and 2 minutes and 30 seconds. For ease, only one of the grouping-condition videos is described. The participants saw a girl before the school. A female narrator introduced the girl. The camera followed the girl entering the school. The narrator introduced the teacher and the camera zoomed in on the place the girl was seated in class. The narrator explained the principle of zarpen, saying "With zarpen you are making a kind of puzzles with several pieces". Then the narrator explained that there are several groups, namely circles and triangles. The narrator mentioned that the girl in the video was placed in the triangle group. Accordingly, the narrator said "she made a zarp test, in which she gave a lot of correct answers. Other children in the triangle group also gave a lot of correct answers. Children in the circle group gave a lot of incorrect answers on the zarp test". Then the camera zoomed in on the triangle group in which the girl was placed, and the camera showed their workbook which had a triangle on it. The teacher said "we are going to start zarpen. The triangle group can work for themselves. I will give the circle group some additional explanation". Afterwards you saw the class working and it was mentioned that the triangle group did not receive additional help, whereas the circle group did. Later on the teacher said that the children were allowed to stop zarpen and can play outside.

In the non-grouping condition, the same structure was used in the video. However, after the explanation about zarpen the narrator said "she made a zarp test, in which she gave a lot of correct answers. Some children in the class also gave a lot of correct answers. Other children gave a lot of incorrect answers". Then the camera zoomed in at the girl and you saw a workbook on all the tables of the children. The teacher said "oke we are going to start zarpen. Some children are allowed to start working for themselves. I will give additional explanation to some other children". Later on the narrator mentioned that some children received extra help, whereas other children did not, including the girl followed in the video.

Attribution to intelligence

In the second part of the experiment, a visual analogue scale-based question was posed to identify the attribution to internal causes. The question in the high-ability condition was "[name avatar] gave a lot of correct answers because she is very smart". Whereas, in the low-ability condition the question was "[name avatar] gave a lot of incorrect answers because she is not smart". The children indicated by a sliding scale from "I don't think so" to "I think so" to which extend they agreed with the statement. The scale ranged from 0-100, however the participants could not see the numbers.

Data analysis

To answer the main research question two hypotheses were analysed. In the analysis an α of .05 was used as level of reliability (results with a *p*-value lower than .05 were significant). Analyses were performed in SPSS.

The linear mixed effect-model analysis was executed to determine the main effects of ability (β_1), the main effect of grouping (β_2), and the interaction effects between ability and grouping (β_3) on the attribution to internal causes (intelligence). The by-subject random intercept (u_0) shows the between-subject variation in average rating on the scale (random effect of how the children used the rating scale). The by-subject random slope ($u_{1ability}$) shows the between-subject variation in how the participants were affected by the ability manipulation. In other words, the extent to which children preferred the high or low-ability condition. The following model was used to determine the attribution to internal causes: $internal\ causes_{ij} = \beta_0 + \beta_1 \times ability_{ij} + \beta_2 \times group_i + \beta_3 ability_{ij} * group_i + u_0 + u_1\, ability + e_{ij}$. In this model 'attribution to internal causes' (smart score, continuous variable) was the dependent variable whereas 'ability' (contrast variable) and 'grouping' (contrast variable) were the independent variables.

Results

Assumptions

Before running the analysis, data was checked on outliers. The assumptions were checked before interpreting the outcome of the linear mixed effects model. The Shapiro-Wilk test was statistically significant (<.001) indicating a violation of the normality assumption. The distribution was skewed to the right and contained three main peaks. The assumptions of normality of the residuals and absence of multicollinearity were met. Finally, Levene's test was statistically significant (<.001), indicating that the assumption of homogeneity of variances was violated. As several assumptions were violated, caution of the reported results of the mixed model is warranted. Additionally, more suitable alternative models regarding the results were chosen and reported, namely the Mann-Whitney *U* test and the Kruskal-Wallis ANOVA.

Primary analysis

Linear mixed effects model

A linear mixed effects model was used to test whether there is an interaction effect between grouping and ability on the smart score (Table 1). A significant main effect for ability was found (p <.001). Children attributed high performance more to intelligence compared to low performance. There was no significant main effect for grouping (p = .64). No statistically significant interaction effect was found between ability and grouping (p = .62). Indicating that ability-grouping does not influence how intelligence is attributed.

Table 1

Coefficients of the Effect of Ability and Grouping on Smart Score

Variable	*B*	*SE*	*β*	*p*	*95%CI*
Intercept	66.71	1.36		<.001***	[64.04;69.39]
Ability	11.54	1.36	0.36	<.001***	[8.87;14.21]
Grouping	-0.64	1.36	-0.02	.64	[-3.31;2.03]
Ability x group	0.67	1.36	0.02	.62	[-2.01;3.34]

Note: N = 490, B = unstandardized B coefficient, β = standardized beta coefficient, *SE* = standard error, *CI* = confidence interval unstandardized B, Grouping indicates whether the participant was placed in the grouping or non-grouping condition. Ability indicates whether the high or low-ability condition was presented. ***** = p <.05, ****** = p <.01, ******* = p <.001

Non-parametric tests

A Mann-Whitney *U* test indicated that the smart score of the low-ability condition was significantly lower than those of the high-ability condition (N = 490, U = 18173.00, z = -7.623, p <.001, two-tailed). This result is in accordance with the results from the linear mixed effect model.

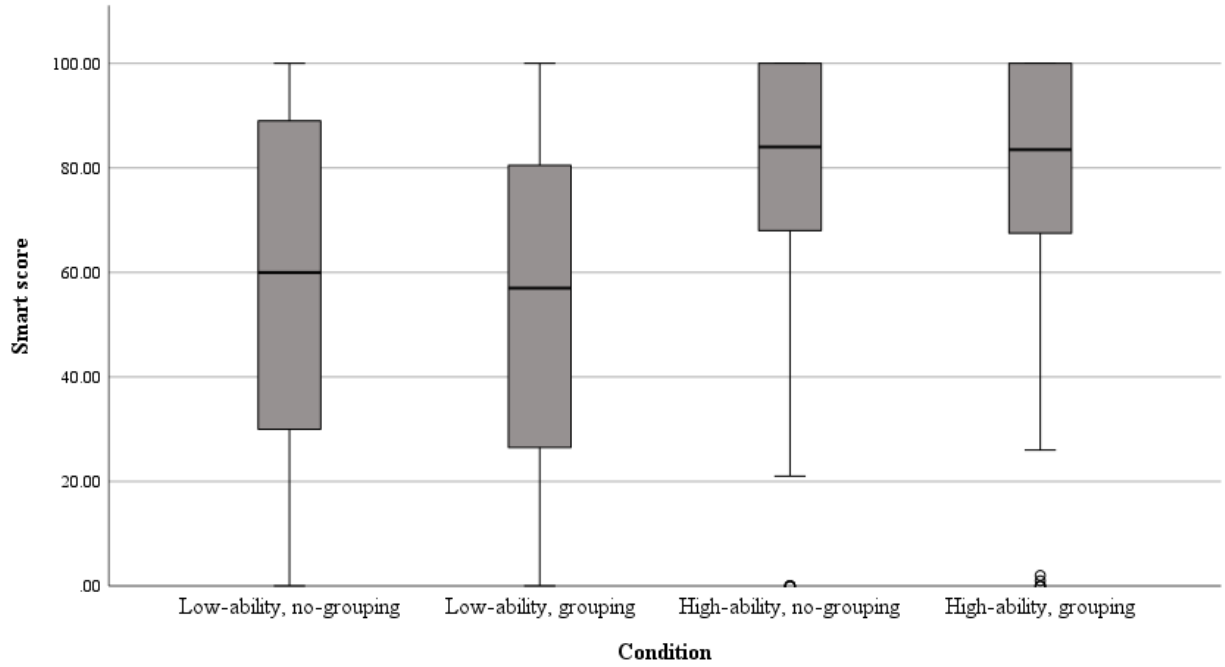
A second Mann-Whitney *U* test indicated that the smart score of the grouped condition was not significantly different from the non-grouped condition (N = 490, U = 29411.00, z = -0.384, p = .70, two-tailed). This result is in accordance with the results from the linear mixed effect model.

A Kruskal-Wallis ANOVA indicated that there were significant differences between the smart score of the "low-ability, no-group" (*Mean Rank* = 204.09), the "low-ability, group" (*Mean Rank* = 190.43), the "high-ability, no-group" (*Mean Rank* = 291.85) and the "high-ability, group" (*Mean Rank* = 295.75) conditions, H (corrected for ties) = 58.738, df = 3, N = 490, p <.001, two-sided.

Post-hoc comparisons using Dunn's method revealed that the significance of the test relied on the significant effect of ability, which is in line with the result found in the linear mixed effects model. The pairwise comparison indicated that there were no significant differences between grouping or no-grouping on the attributed intelligence, within the high-ability conditions (p = .83). The same was true for the grouping and no-grouping within the low-ability condition (p = .45). This suggests that grouping was not of influence on the attributed intelligence. Significant differences were found between the low- and high-ability conditions (p <.001), indicating that in both the grouping and no-grouping condition, children attributed high performance more to being smart than low performance (Figure 2).

Figure 2

Smart Score of the Different Conditions



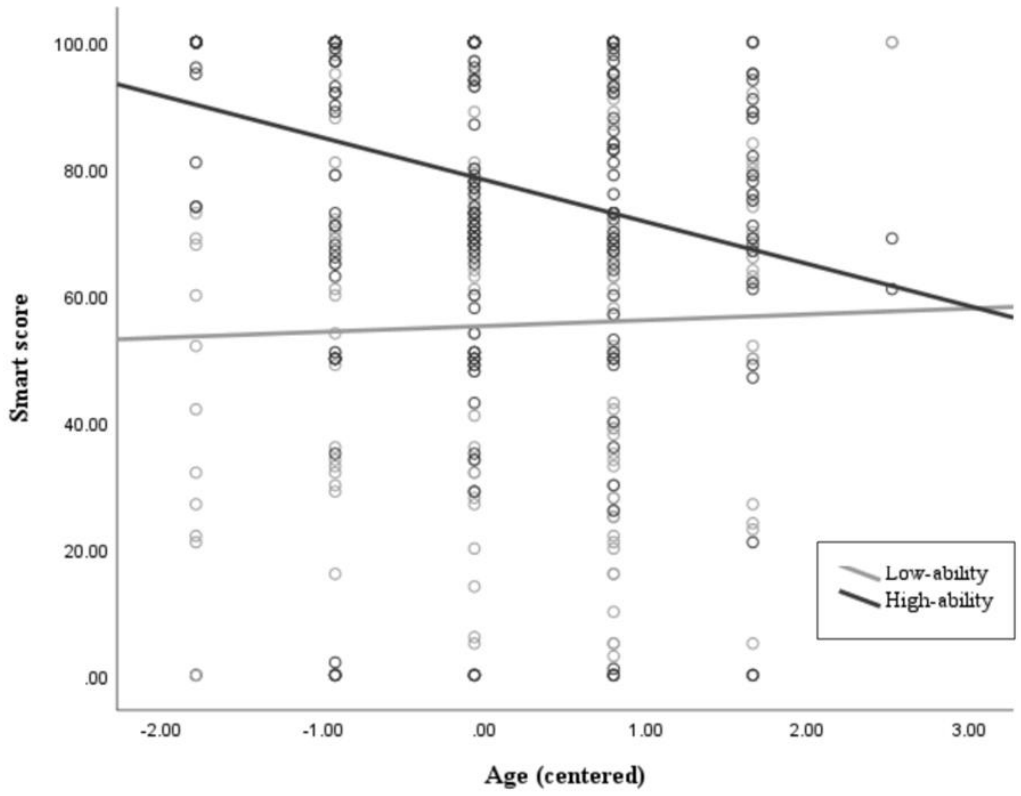
Note: *N* = 490. The boxes indicate the interquartile range of the observations from quartile 1 to quartile 3, the whiskers indicate the minimum and maximum observed smart scores (excluding outliers).

Secondary analysis – Linear mixed effects model

To verify whether results of the linear mixed effects model were consistent independent of age, gender and task type (kroemen vs. zarpen) secondary analysis were performed. Gender and task type were analyzed as contrast variable. There were no statistically significant main effects or interactions when gender and task type were included in the linear mixed effects model (all *p'*s > .19*)*. This indicates that it does not matter whether participants were boys or girls, and if they saw a video about zarpen or kroemen, in terms of how they attributed intelligence. There was a significant interaction between age (in years, centered continuous variable) and ability (β = -0.12 , *SE* = 1.35, *p* = .01, *95%CI* = [-6.35;-1.04]), suggesting a moderating effect of age (Figure 3). Simple slope analysis revealed that younger children (1*SD* under the mean) thought that children had a high performance (vs. low performance) because they were smarter (β = -0.27, *SE* = 1.55, *p* <.001, 95%*CI* = [-9.69;-3.59]). Older children (*1SD* above the mean) attributed both groups as equally smart (β = -0.03, *SE* = 2.20, *p* = .68, *95%CI* = [-3.41;5.25]).

Figure 3

Interaction of Ability and Age on the Smart Score



Discussion

Ability-grouping is a prevalent form of grouping used in schools to enhance academic achievement. It was hypothesized that grouping children by ability provokes essentialism (Rhodes & Mandalaywala, 2017), which results in the development of internal attributions towards their peers' intelligence. As these internal attributions may create learned helplessness, self-handicapping (Graham, 2020; Hallahan, 2020) and have negative influences on effort and challenge seeking (MacIntyre & Ireson, 2002), it is important to get more insights into the underlying processes and influential factors. Results of the current study suggest that ability-grouping itself does not affect how children attributed the intelligence of their peers. However, performance alone was found to influence how children attribute intelligence. Participants attributed a high performance more to being intelligent compared to low performance. Notably, this effect was particularly pronounced in younger children, who strongly associated high performance with high intelligence. In older children, this tendency diminished, with older children attributing high performance to high intelligence to a lesser extent. No significant effects from gender and task type were observed. These results suggest that internal attributions do not develop due to ability-grouping.

Effect of ability-grouping

It was expected that grouping children by ability would create a categorization (Dunham et al., 2011), which promoted internal attributions (intelligence) (Graham, 2020) and essentialists beliefs for performance more strongly compared to when children are not grouped (Rhodes & Mandalaywala, 2017). Despite the theoretical predictions, the results showed that children attributed performance to the same extent to intelligence, regardless of whether they were grouped by ability or not. According to Dunham et al. (2011) minimal conditions are required to form groups. The finding challenges the idea that minimal conditions are sufficient to form groups.

An explanation for the absence of a grouping-effect is the absence of clear group memberships, possibly explained by the observer role of the children. This suggests that clear group memberships, rather than an observer role, may be necessary for a grouping-effect to occur. Without a clear group membership, children showed weaker loyalty norms and ingroup favouritism (Abrams et al., 2003). Additionally, when more prominent in- and out-groups were created in children (4.5-6 years old), the grouping induced essentialist beliefs about these novel groups (Rhodes et al., 2018). This indicates the importance of distinct in- and out-groups for a grouping-effect. However, in the current study such prominent in- and outgroups were absent. In contrast, children from 6 years onwards already have the ability extend the grouping principles beyond mere group inclusion (Rhodes & Chalik, 2014). This implies that a grouping-effect would still manifest, even when children are in an observer role.

Effect of performance

The current study found that performance influences the attributed intelligence, especially in younger children. This confirms that young children already attribute academic achievement to ability (Muradoglu & Cimpian, 2020). Furthermore, these results are in line with previous research indicating that children belief that intelligence has a positive relation with academic performance, and both are thought to be relatively stable over time (Stipek & Gralinski, 1996). Since stability is one of the components of essentialist beliefs and essentialism suggests that characteristics stem from internal causes (Rhodes & Mandalaywala, 2017), this may indicate that children attribute intelligence to internal causes.

Overall, in the high-performance groups, intelligence was more strongly attributed to intelligence than in the low-performance groups. The decreased attribution of a low performance to intelligence may be explained by the findings indicating that attitude changes towards stigmatized groups (Batson et al., 1997). Individuals developed more feelings of empathy towards stigmatized groups, resulting in more positive attitudes. Individuals with learning disabilities are more be vulnerable for stigmatization (Haft et al., 2023), which suggestively may be true for low performances as well. In relation to the current study, feelings of empathy may arise towards the low-performing

group, resulting in more moderate answers towards the attributed intelligence. Future research should incorporate questions regarding potential stigmatization and empathy, thereby making it possible to correcting for such effects.

The impact of performance on attributed intelligence was more pronounced in younger children compared to older children, indicating the presence of an age-related decline. The age-related decline aligns with previous research showing that ability-performance beliefs decline over age (Stipek & Gralinski, 1996). The ability-performance beliefs consisted of the idea that ability is stable and rather unaffected by effort. Seemingly, younger children perceive ability as more stable and unchangeable. As children grow older, they tend to give a greater importance to the role of effort (Stipek & Gralinski, 1996).

Furthermore, the age-related effect of the attribution to intelligence was more evident in the high-ability group compared to the low-ability group. This may suggest that young children perceive a high performance as stable, and low performance as less stable, which is in line with the study of Sierksma (2023). Young children (6-9 years old) assumed that a high competence is less easy to change, and therefore more stable, compared to a low competence (Sierksma, 2023). The children thought that practicing (vs. not practicing) a skill would be more beneficial when children were less competent. In case the younger children in the current study have perceived high performance as more stable, they may have attributed it to a bigger extent to internal causes.

An explanation for the age-related decline in attributed intelligence is the development of reasoning and thinking in children. Young children have a rather straightforward and causal way of thinking, based on previous experiences (Barrouillet & Gauffroy, 2013). Their ideas can easily change. As children grow older, their cognitive processes become less dependent on social contexts and become more abstract and generalized (Barrouillet & Gauffroy, 2013). This results in a more sophisticated way of thinking. Considering the current study, older children may have developed more nuanced interpretations of performance. While young children may see a direct link between ability and intelligence, this may be more complex in older children.

Strengths and limitations

The current study is innovative due to its use of an experimental design, which is a strength. Experimental studies may reveal causal connections rather than identifying correlations. Additionally, the study assessed children across a wide age-range, including younger children, for whom literature is relatively scarce. The findings of the current study provide a preliminary understanding of the mechanisms involved in the relationship between ability-grouping and social-cognitive effects.

A limitation of the study was the use of the visual analogue scale on a laptop. Younger children found it hard to use the visual analogue scale accurately because of the sliding function.

Therefore, the visual analogue scale may not be a reliable measure method for younger children (Shields et al., 2003). To combat the challenges the younger children faced with the visual analogue scale, it is suggested to look for a more age-appropriate measurement in future studies. For example, by performing the experiment on a tablet or by giving answer options. This latter would not require the sliding function, which may be easier to use for children.

Future directions

Future studies could enhance the experimental design by transitioning form third-party inferences to involving the children as active participants. In the current study, children watched a video, which may have had a low ecological validity. Active participation could provide more accurate insights into the effect of ability-grouping on the attribution to intelligence. To measure this effect, a more interactive study design should be developed. For example, children could make a zarp or kroemen test, and then be informed about their performance regardless of their actual results. Based on this feedback, they could be grouped by ability or remain ungrouped. Extra reminders about their group memberships could be given to enhance the development of in- and out-groups. Researchers could measure how children attribute intelligence using the visual analogue scale.

Furthermore, future studies could explore the influence of social contexts on the effect of ability-grouping. Parents play an important role in shaping and developing children's beliefs, values and attitudes, including their attitude towards academic performances (Bornstein, 2019). If parents focus on equality and downplay distinctions between individuals or characteristics, this could potentially influence how children perceive ability-groups. As a result, these children may view ability-grouping as not significant. To see whether parents' beliefs are of influence future research could incorporate a questionnaire for parents, with elements including questions about how they attribute competence to intelligence, their competitiveness, and how they value high performance.

Moreover, it might have been important to ask schools whether they already implemented ability-grouping in their school system. Essentialist beliefs result from the interplay of children's general conceptual biases, cultural input and context (Rhodes & Mandalaywala, 2017). Familiarity to ability-grouping suggestively increases essentialist beliefs and may result in stronger attributions towards intelligence. Therefore, grouped children may consistently attribute intelligence more to internal causes (intelligence), resulting in less variation in these attributions over time, regardless of age. Future studies could examine if previous exposure and familiarity with ability-groups affect the way children attribute performance to internal causes, for instance by comparing schools with and without implemented ability-groups.

Conclusion

In conclusion, current study did not find an effect of ability-grouping on the attributed intelligence in their peers. This challenges the theories stating that minimal conditions are sufficient to create grouping and provoke essentialism. Instead, it reveals the nuanced dynamics of how children attribute intelligence. Indicating that performance, rather than grouping, drives these internal attributions, particularly in younger children. In high-performance groups the internal attributions were stronger, which highlights the importance of giving feedback on a positive performance. Thereby potentially shaping more positive beliefs about a child's intelligence. By emphasizing on a child's potential to grow and increase in effort, the possible negative consequences of internal causes on motivation and challenge seeking may be countered. Furthermore, this study challenges teachers to look beyond within-class ability groupings and focus on more personalized approaches that focus on the individual needs of each child. By reevaluating the need for ability-grouping and focussing on more personalized approaches for each child, we might get closer to the most beneficial learning environment.

Reference list

Abrams, D., Rutland, A., Cameron, L., & Marques, Josém. (2003). The development of subjective group dynamics: When in-group bias gets specific. *British Journal of Developmental Psychology*, *21*(2), 155–176. https://doi.org/10.1348/026151003765264020

Barrouillet, P., & Gauffroy, C. (2013). *The development of thinking and reasoning* (1st ed.). Psychology Press. https://doi.org/10.4324/9780203068748

Batson, C. D., Polycarpou, M. P., Harmon-Jones, E., Imhoff, H. J., Mitchener, E. C., Bednar, L. L., Klein, T. R., & Highberger, L. (1997). Empathy and attitudes: Can feeling for a member of a stigmatized group improve feelings toward the group? *Journal of Personality and Social Psychology*, *72*(1), 105–118.

Bornstein, M. H. (2019). *Handbook of parenting. Volume 3, being and becoming a parent* (3rd ed.). Routledge.

Brewer, M. B. (1991). The social self: On being the same and different at the same time. *Personality and Social Psychology Bulletin*, *17*(5), 475–482. https://doi.org/10.1177/0146167291175001

Carlos Núñez, J., González-Pienda, J. A., González-Pumariega, S., Roces, C., Alvarez, L., González, P., Cabanach, R. G., Valle, A., & Rodríguez, S. (2005). Subgroups of attributional profiles in students with learning difficulties and their relation to self-concept and academic Goals. In *Learning Disabilities Research & Practice* (Vol. 20, Issue 2).

Dunham, Y., Baron, A. S., & Carey, S. (2011). Consequences of "minimal" group affiliations in children. *Child Development*, *82*(3), 793–811. https://doi.org/10.1111/J.1467-8624.2011.01577.X

Graham, S. (2020). An attributional theory of motivation. *Contemporary Educational Psychology*, *61*, 101861. https://doi.org/10.1016/J.CEDPSYCH.2020.101861

Haft, S. L., Greiner de Magalhães, C., & Hoeft, F. (2023). A Systematic review of the consequences of stigma and stereotype threat for individuals with specific learning disabilities. *Journal of Learning Disabilities*, *56*(3), 193–209. https://doi.org/10.1177/00222194221087383

Hallahan, M. (2020). Learning styles / fixed vs. growth mindset. *The Wiley Encyclopedia of Personality and Individual Differences*, 545–549. https://doi.org/10.1002/9781118970843.CH355

Harter, S. (1999). *The construction of the self: A developmental perspective*. Guilford.

Hattie, John., & Anderman, E. M. (2013). *International guide to student achievement*. 504. https://books.google.com/books/about/International_Guide_to_Student_Achieveme.html?hl=nl&id=SUn8DWG-DyEC

MacIntyre, H., & Ireson, J. (2002). Within-class ability grouping: Placement of pupils in groups and self-concept. *British Educational Research Journal*, *28*(2), 249–263. https://doi.org/10.1080/01411920120122176

Marsh, H. W., Relich, J. D., & Smith, I. D. (1983). Self-concept: The construct validity of interpretations based upon the SDQ. *Journal of Personality and Social Psychology*, *45*(1), 173–187. https://doi.org/10.1037/0022-3514.45.1.173

Matthews, M. S., Ritchotte, J. A., & Mcbee, M. T. (2013). High ability studies effects of schoolwide cluster grouping and within-class ability grouping on elementary school students' academic achievement growth. *High Ability Studies*, *24*(3). https://doi.org/10.1080/13598139.2013.846251

Meece, J. L., Parsons, J. E., Kaczala, C. M., & Goff, S. B. (1982). Sex differences in math achievement: Toward a model of academic choice. *Psychological Bulletin*, *91*(2), 324–348. https://doi.org/10.1037/0033-2909.91.2.324

Muradoglu, M., & Cimpian, A. (2020). Children's intuitive theories of academic performance. *Child Development*, *91*(4), e902–e918. https://doi.org/10.1111/CDEV.13325

Papachristou, E., Flouri, E., Joshi, H., Midouhas, E., & Lewis, G. (2022). Ability-grouping and problem behavior trajectories in childhood and adolescence: Results from a U.K. population-based sample. *Child Development*, *93*(2), 341–358. https://doi.org/10.1111/CDEV.13674

Patterson, M. M., & Bigler, R. S. (2006). Preschool children's attention to environmental messages about groups: Social categorization and the origins of intergroup bias. *Child Development*, *77*(4), 847–860. https://doi.org/10.1111/j.1467-8624.2006.00906.x

Rhodes, M., & Chalik, L. (2014). The interplay between intuitive psychology and intuitive sociology. *British Journal of Developmental Psychology*, *32*(3), 248–251. https://doi.org/10.1111/bjdp.12050

Rhodes, M., Leslie, S.-J., Saunders, K., Dunham, Y., Cimpian, A., & Marjorie Rhodes, C. (2018). How does social essentialism affect the development of inter-group relations? *Developmental Science*, *21*, 12509. https://doi.org/10.1111/desc.12509

Rhodes, M., & Mandalaywala, T. M. (2017). The development and developmental consequences of social essentialism. *WIREs Cognitive Science*, *8*, 1437. https://doi.org/10.1002/wcs.1437

Shields, B. J., Shields, B. J., Palermo, T. M., Powers, J. D., Grewe, S. D., & Smith, G. A. (2003). Predictors of a child's ability to use a visual analogue scale. *Child: Care, Health and Development*, *29*(4), 233–319. https://doi.org/10.1046/j.1365-2214.2003.00343.x

Sierksma, J. (2023). Children perpetuate competence-based inequality when they help peers. *Npj Science of Learning 2023 8:1*, *8*(1), 1–11. https://doi.org/10.1038/s41539-023-00192-9

Steenbergen-Hu, S., Makel, M. C., & Olszewski-Kubilius, P. (2016). *What one hundred years of research says about the effects of ability grouping and acceleration on K–12 students' academic achievement*. *86*(4), 849–899. https://doi.org/10.3102/0034654316675417

Stipek, D., & Gralinski, J. H. (1996). Children's beliefs about intelligence and school performance. *Journal of Educational Psychology*, *88*(3), 397–407. https://doi.org/10.1037/0022-0663.88.3.397

Tajfel, H., & Turner, J. C. (2004). The social identity theory of intergroup behavior. In *Political Psychology* (pp. 276–293). Psychology Press. https://doi.org/10.4324/9780203505984-16