

EÖTVÖS LORÁND University of Education
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Education

Theses

*Havasi Ágnes: Communication of pupils with autism
and complex communication need – doctoral
dissertation*

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1. Background

In my doctoral dissertation I discussed the background literature along six issues, moving from the broader background to the narrower focus. The theoretical background chapter begins with a definition of the autism spectrum, followed by a description of the behavioural characteristics that strongly determine the organisation of support. This is followed by a detailed discussion of the nature of human communication, which is the focus of this dissertation, and the atypical communicative behaviours present in autism, and then I proceed to the intervention with a brief summary of the education of autism.

I discuss the issues of communication development (of which communication support for people with autism and complex communication needs [CCN] is a more detailed part) in the fifth chapter of the dissertation. The final and most extensive chapter of the theoretical background reveals the possibilities of augmentative and alternative communication (AAC) for people with autism, briefly summarising the issues surrounding the use of AAC tools and methods, and discussing in detail the focus, findings and dilemmas of AAC research.

As a starting point it can be stated that communication is a fundamental human right, and a tool for development in other abilities and skills, collaboration and learning (Ganz, 2015; Iacono, Trembath & Erickson, 2016; Logan, Iacono, & Trembath, 2017, Kálmán, 2006; UN, 2006). Given that autism is characterised by typical limitations in reciprocal social interactions and social communication (APA, 2013; WHO, 2018) which pose theoretical and practical challenges for education (Keen, Paynter, Trembath & Simpson, 2016; Iacono, Trembath & Erickson, 2016; Light & McNaughton, 2015).

Comprehensive, eclectic educational approaches for autism spectrum disorder are evidence-based theoretically and empirically, but their implementation in educational practice is not yet widespread (NRC, 2001; Harris, Handleman, & Jennett, 2005; Costley, Clark, & Bruck, 2014; Fleming, Hurley, & Mason, 2015; Odom, Boyd, Hall, & Hume, 2014; NAC, 2015; Reed, 2016; Stefanik, 2018)

Communication, as a key area, needs support in all cases, but there are still no clear and integrated educational methodologies to enhance social communication in autism. (Ogletree, Oren, & Fischer, 2007; Rogers, & Vismara, 2008; Quill, 2009; Odom, Collet-Klingenberg, Rogers & Hatton, 2010; Stefanik & Ósziné, 2013; Bottema-Beutel, Yoder, Woynaroski & Sandbank, 2014)

Approximately 20-25% of pupils with autism do not use functional speech when they start school (Mirenda et. al, 2013). This group with complex communication needs has an explicit need to support functional communication with alternative strategies in education. Simple preverbal communication forms are not sufficient for effective participation in everyday communication and the creation of more abstract meanings. (Tager-Flusberg & Kasari, 2013; Kim, Paul, Tager-Flusberg & Lord, 2014) For this reason, augmentative and alternative communication (AAC) systems are needed in these cases. (Beukelman & Mirenda, 2013; Light & Mcnaughton 2015) AAC is a set of tools and strategies by which communication skills of people with complex communication needs can be maximized for functional and effective communication, whether they are paper dictionaries with pictures, communicative objects or digital speech generating devices (SGDs). (Beukelman & Mirenda, 2013; Ganz 2014; Iacono, Trembath & Erickson, 2016; Quill & Stansberry Brusnahan, 2017) In my dissertation, I explored the history of the use of AAC in autism, based on the analysis of 188 studies and 19 professional policies and EBP (evidence-based practice) summaries. In summary, there are already some well-described

strategies in different methodological approaches, but there is little scientific evidence to support the effectiveness of AAC, the focus and results of empirical studies are diverse and divergent, with mostly single-case studies. However, it appears in the literature as an emerging pedagogical practice with clear expert recommendations of AAC-use (e.g. Frost & Bondy, 2002; Quill & Stansberry Brusnahan, 2017; Jordan, Roberts & Hume, 2019; EMMI, 2020).

The term AAC also refers to a field of research. In autism, the topic is highly under-researched, with a number of ethical and methodological challenges, which I summarise in detail in my dissertation. (Parsons, Charman, Faulkner, Ragan, Wallace & Wittemeyer, 2013; Sievers, Trembath & Westerveld, 2018; Ganz, 2015, Havasi, Stefanik, Győri, 2019)

2. Aim, questions and hypotheses

I presented our research in Part II of the dissertation in six chapters: the presentation of the aims and methods, the results of the exploratory questions and their discussion, the results chapter presenting changes and correlations and the discussion of the chapter itself. I concluded the paper with a brief summary.

Our research design was approved by the Research Ethics Committee of the ELTE BGGYK under the number KEB/2016/002.

The aim of the research was to explore the patterns of communication and AAC-use of a group of first grade pupils with autism and complex communication needs, to study the changes of these patterns during the school year, and to capture the relationship of these patterns and changes with different environmental factors, individual performance and characteristics.

Our research was guided by the following questions:

- How do children with autism and CCN communicate, and how does AAC appear in their communication?
- How does communication and AAC-use change over the course of a school year?
- What factors are associated with the level and variation of communication and AAC-use in this group?
- Is participation in communicational interactions ensured for children with autism and CCN?

In the long term, we hope that our research will contribute to the development of methodologies, through a better understanding of the communication characteristics and development of this group, is to provide a solid evidential basis to enable teachers and other professionals to support communication and participation of children with autism. We hope that will enable educators to apply evidence-based procedures with a clear methodological background to the development of effective communication skills for children with autism using AAC-systems.

Hypotheses for the relationships between developmental and background factors were formulated along the lines of the research history summarised in the theoretical background chapter and they guided our analyses.

3. Participants

The study involved 51 children (9 girls and 42 boys) with autism, their primary caregivers (47 mothers, 3 fathers and a guardian) and their teachers (22 women: 2 social teachers, 20 SEN-teachers, including 5 with a degree in autism spectrum specialisation). The distribution of clinical diagnoses classified as autism spectrum disorder (according to BNO-10) in the study group: 31 childhood autism, 12 pervasive developmental disorder, 8 autism spectrum disorder. At the time of the study, the children were all enrolled in a lower grade primary school with special education in 19 classes in 16 institutions (7 in Budapest and 9 in rural areas). At the beginning of the study, all children were aged between 5 years 9 months and 10 years 9 months (mean: 8 years 6 months), they did not use functional speech or were minimally verbal (used less than 10 words in expressive oral communication at the beginning of the study), all of them were children with complex communication needs.

4. Methods, design and analysis

The following tools and methods were used to carry out our measures along the following focuses:

- (1) monitoring of the school/developmental/educational environment using the NAS¹ Standard (AET, 2012; Jones, Baker, English & Lyn-Cook, 2012) and through observation, document analysis and semi-structured teacher interviews, as well as other background data on school education through our own questionnaires
- (2) observation of spontaneous intentional communication and AAC-use at school through video analysis of natural classroom situations with M-COSMIC² (Clifford et al., 2010) and mapping of AAC-use with the AAC-use questionnaire³ developed on the basis of TEACCH (Watson, Lord, Shaffer & Shopler, 1989)
- (3) formalized measures of intellectual performance using the Leiter-R⁴ (Roid, Miller, 1997) nonverbal intelligence test
- (4) a formalized measure of adaptive behaviour level with the caregiver interview version of VABS II.⁵ (Sparrow, Balla & Cicchetti, 2005)
- (5) Measuring the socio-economic status: simplified SES, family background with the HÉI⁶ (Balázs, Zempléni, 2004) questionnaire in the caregiver interview
- (6) mapping of essential background information (e.g. age, diagnosis, comorbidity) based on our own questionnaire and caregiver interview.

¹ National Autism Standard

² Modified Classroom Observation Schedule to Measure Intentional Communication

³ Assessment of Spontaneous Communication

⁴ Leiter International Performance Scale, Revised

⁵ Vineland Adaptive Behaviour Scale 2nd ed.

⁶ Hozottérték-Index (Valueadded-Index)

The measures were divided into three periods during the school year. The first phase took place during the second and third months of the school year, when the first teacher and caregiver interviews were concluded, as well as the first classroom observations. In the second phase, during the fourth and fifth months of the school year, observations of the educational environment, the collection of educational background information and IQ-measuring were carried out. In the third phase, during the eighth and ninth months of the school year, the second teacher and caregiver interviews and the second classroom observations were conducted. (See Figure 1)

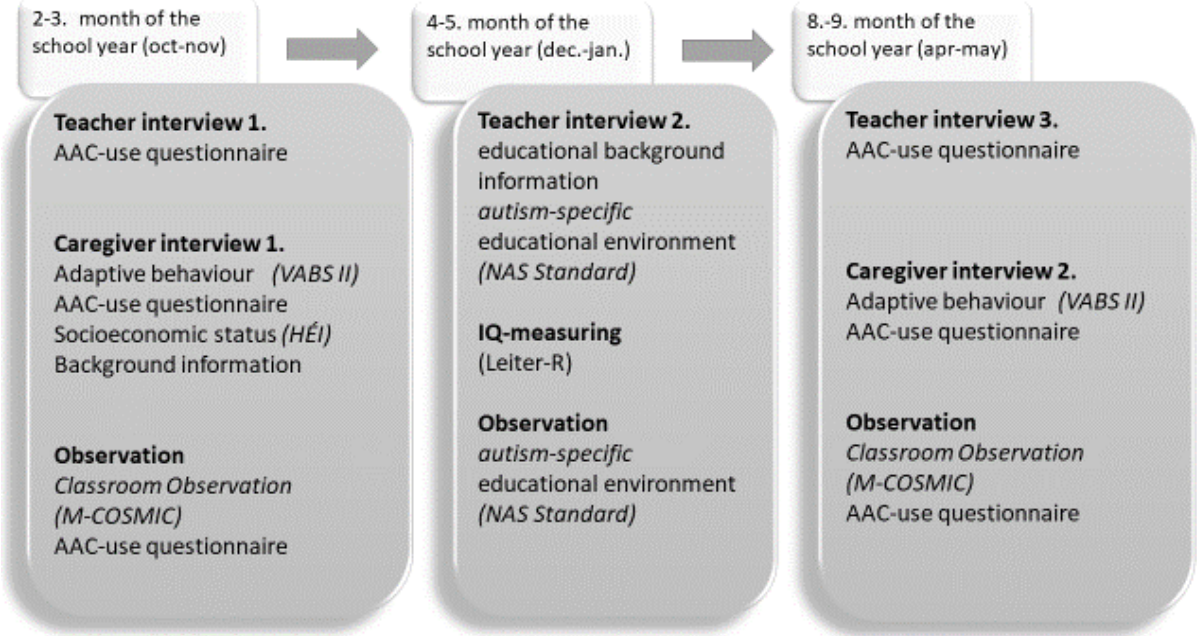


Figure 1: Overview of research methods and research design

After recording and cleaning the data, we had such a large amount of data that we created summary indicators to easier interpretation fo results and to allow statistical analysis. As the study is essentially quantitative, our analyses are based on statistical tests. The choice of the tests was largely influenced by the design of the study and the resulting variables, the sample size and the results of the first-stage distribution studies. To answer our exploratory questions, our analyses used simpler, mainly descriptive statistics. Given our (statistically) smaller sample size, we used robust tests in the statistical analysis of the prospective study. In our analyses regarding the prospective study, in addition to examining the existence and strength of relationships between individual factors, we also attempt to capture trends in the direction and quality of the relationship by performing linear regression analyses in addition to the basic correlation calculations.

5. Main results 1 – Results of exploratory study

Below we present our results and evaluate our hypotheses in a simplified manner, the results are presented in detail in chapter 9, and a detailed discussion of the results is presented in chapter 10 of the dissertation.

5.1 EDUCATIONAL AND HOME ENVIRONMENT

Our results regarding the autism-specific educational context show that two thirds of children are still significantly far from learning in an optimal educational environment, the area of relationship building is the weakest, and professionals' theoretical and practical knowledge of autism and AAC is varying, uneven and often insufficient.

The socio-economic situation of pupils mixed and not correlated with the quality of schools and the performance of children's adaptive behaviour (for more details on the results, see sub-chapter 9.3 and the discussion of the details in chapter 10 of the dissertation).

5.2 COMPREHENSIVE PROFILE

All pupils show low levels of Adaptive Behaviour Component (ABC) based on the VABS results and this is also true for the VABS communication, socialization and daily living skills (DLS) subscales. Intelligence is slightly more uneven across the sample, but the majority of cases have an intellectual disability (ID) (7 low average, 11 mild ID, 33 moderate or severe ID). There is no "gap" between intelligence and adaptive behaviour as expected based on the literature, there is no significant difference between their means.

The sample is in the high support needs group in terms of language, intellectual performance and adaptive behaviour.

5.3 COMMUNICATION PROFILE

Main results of the VABS

The analysis based on the VABS communication subscale shows that communication is significantly weaker than both socialization and daily living skills. Within the communication subscale, the expressive domain is weaker than both the written and receptive domains. This result indicates a strong need for support in expressive communication.

Main results of school communication (M-COSMIC)

A 15-15 minute video of each pupil in a learning, eating and leisure/free time situation was analysed. For each intentional communication interaction, we recorded the purpose (function), form and partner of the interaction and the role of the pupil in the interaction. In case of AAC-use, we also recorded the tool. With 76.5 hours of video recordings, 4224 functional communication interactions were analysed. Most interactions took place in structured learning situations. Our results showed that pupils interacted primarily with their teachers for simple functions (request, consent), mostly in the role of respondent, using simple forms such as actions.

However, conventional preverbal behaviours and AAC-use in one tenth of the interactions are also recorded, as well as (significantly less often) more abstract, socially more difficult functions such as ask attention or comments.

Keeping the analytical criteria “together”, we also identified “frequent interaction patterns”, which included patterns that we saw as less frequent, in purely quantitative terms: for example, frequent patterns included interactions with peers, interactions with initiation role, one-word expressions and AAC-use that was more prominent in terms of the topic.

All in all, we saw similar communication profiles in the beginning and end-of-school-year measures, which indicated that pupils were in the early stages of communication.

See the results in detail in subsection 9.4 and their discussion in chapter 10. of the dissertation.

5.4 AAC PROFILE

More than half of the pupils use AAC in school situations. AAC-use is present in one tenth of all interactions. Based on a broader survey, almost all pupils (48/51) use AAC. The two school-based measures of AAC-use depicts a stable picture with individual differences and no major outliers. If we consider that with the observation of school situations we monitored a “usual’ AAC-use and with the the questionnaire we monitored the “best AAC-use over time’, the significant difference in multidimensional analysis suggests that there is a gap between “usual’ and “best’ AAC-use.

Main results of AAC-use at schools (M-COSMIC)

We analyzed 513 interactions in which AAC-use was (also) present. By analyzing the communicational dimensions, it can be said that pupils barely use any features beyond requests, and that they use AAC modes only with their teachers. The primary AAC tools are paper-based picture-tools, but we also recorded AAC-communication via communicational objects and gestures. The use of AAC was present in all observed school situations, most often in guided learning and the highest proportion of these pupils used AAC in eating situations.

With AAC-use multidimensionally fewer (than overall interactions) actions and more conventional forms appear. 25% of single-word phrases and 42% of two-word phrases can be registered with the use of AAC. There is a higher proportion of interactions in the initiation role compared to the more passive respondent role, suggesting more functional communication than in overall interactions as a whole.

Main results of the AAC-use questionnaire

We registered a significantly more varied AAC-use in all dimensions than in the school observation. In addition to school situations, AAC-use at home is common (but hardly ever goes “beyond the walls’) and, in this case too, pupils only barely show more abstract forms, socially more difficult functions with AAC-use.

All in all, we see a similar AAC profile in the beginning and end-of-school-year measures, which shows that pupils are confident in using the initial steps of AAC-use. It seems that what AAC is “unique’ in (more abstract messages, language substitution role) is still lacking.

See the results in detail in subsection 9.5 of the dissertation and their discussion in chapter 10.

6. Main results 2 – Changes in the longitudinal study and associations of different factors

In the dissertation, we have formulated hypotheses (see dissertation, subsection 7.2) about the changes in and the relationships between overall adaptive behaviour, overall communication and AAC-use. Below, we present our results and evaluate our hypotheses in a simplified manner along these hypotheses. The results are presented in chapter 11 of the dissertation and discussed in detail in chapter 12.

6.1 HYPOTHESES ABOUT INTELLIGENCE AND OVERALL ADAPTIVE BEHAVIOUR

We presented our results in subsection 11.3.1 and discussed them in detail in chapter 12 of the dissertation.

1. A correlation can be identified between the IQ of pupils with autism and complex communication needs, and VABS ABC, as well as the adaptive behaviour subscales standard scores (Perry, Flanagan, Geier & Freeman, 2009; Charman, Pickles, Simonoff, Chandler, Loucas, & Baird, 2011; Kraper, Kenworthy, Popal, Martin & Wallace, 2017).

In the first measure, the IQ and the ABC show a weak ($r(32)=0.321$, $p=0.064$), in the second one a stronger ($r(32)=0.550$, $p=0.001$) correlation.

Among the VABS subscales, in the first measure communication, in the second one both communication ($r(32)=0.641$, $p<0.001$); DLS ($r(32)=0.501$, $p=0.003$); and socialization ($r(32)=0.407$, $p=0.001$) show a correlation with IQ.

A correlation between pupils' IQ and ABC can be confirmed.

A correlation between pupils's IQ and standard scores of the adaptive behaviour subscales was confirmed: in case of the communication subscale at both measures, and for the socialisation and daily living subscales at the second measure.

2. In the group of pupils with autism and complex communication needs, the ABCs are significantly higher than the IQs (Tager-Flusberg, Paul & Lord, 2005; Charman, Pickles, Simonoff, Chandler, Loucas, & Baird, 2011; Bauminger-Zviely, 2014).

The mean of IQ is not significantly different from the mean of the ABC (in the first measurement: $t(33)=-0.25$, $p=0.901$; in the second measurement: $t(33)=0.064$, $p=0.950$).

It cannot be confirmed that the ABCs are significantly higher than the IQs.

6.2 HYPOTHESES ABOUT COMPREHENSIVE COMMUNICATION

We presented our results in subsection 11.3.2 and discussed them in detail in chapter 12 of the dissertation.

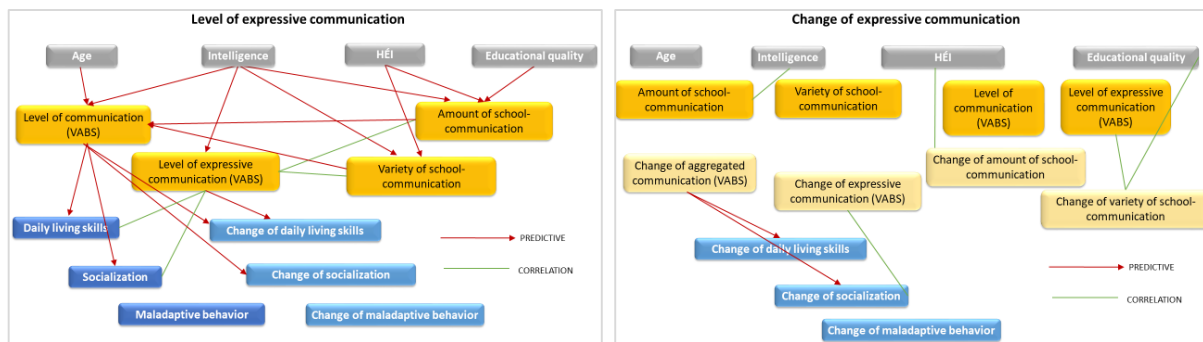


Figure 2: The associations of expressive communication

6.2.1. THE COMMUNICATION LEVEL OF PUPILS WITH AUTISM AND COMPLEX COMMUNICATION NEEDS, RECEIVING INTENSIVE AUTISM-SPECIFIC EDUCATION, SHOWS A CHANGE OVER A SIX-MONTH PERIOD

(Wetherby & Prutting, 1984; Siegel-Causey, 1989; Calandrella & Wilcox, 2000; Iacono, Carter & Hook, 1998; Charman, 2003; Bruinsma, Koegel & Koegel, 2004; McDuffie, Yoder & Stone, 2005; Chiang, Soong, Lin, & Rogers, 2008; Rowland, 2009; Miranda & Iacono, 2009; Prelock, Paul & Allen 2011; Keen, Meadan, Brady & Halle, 2016; Maljaars, Noens, Jansen, Scholte, & van Berckelaer-Onnes, 2011, Shire Kasari, Kaiser & Fuller, 2016; Zwaigenbaum, Bryson, Rogers, Roberts, Brian & Szatmari, 2005; Kasari, Paparella, Freeman & Jahromi, 2008; Rowe & Goldin-Meadow, 2009; Nunes, 2015).

1.a The level of communication⁷ develops over a 6-month period.

Expressive communication shows a significant ($T=231.5$ $Z=-5,-3,382$, $p=0.001$) increase in raw scores. There is no significant increase in the total amount of school-communication, but there is a significant increase in the amount of communication in case of free time situations ($T=359$ $Z= -2.353$ $p=0.019$). We can register a significant change in the partners dimension in the category of peers ($T=126$ $Z=-2.214$ $p=0.03$), in the function dimension in the categories of compliance ($T= 165.5$ $Z=-3.861$ $p<0.001$), showing ott/attention ($T=264.5$ $Z=-1.967$ $p=0.049$) and requesting information/clarification ($T=3$ $Z=2, 701$ $p=.007$) functions, and in the main categories in dyadic interactions ($T= 233.5$ $Z=-3.642$ $p=$), in the form dimension in gaze shift ($T=31.5$ $Z=-2.17$ $p=0.03$) and gaze following ($T=74.5$ $Z=-2.94$ $p=0.003$). Between the two measures, there is a significant increase ($T=397$ $Z=-2.489$ $p=0.013$) in the joint variability index. In the variety of the individual dimensions, there is a significant increase ($T=397.5$ $Z=-2.489$ $p=0.013$) in function dimension.

In the comprehensive expressive communication and in several aspects of school communication, a qualitative increase can be observed in the sample, confirming that the level of communication is improving over the six-month period studied.

⁷ the term level refers to both quantitative indicators and diversity of communication skills/behaviours

1.b The level of communication recorded at the time of the first measure is correlated with the level of communication measured six months later.

Among the VABS measures, the results in the receptive domain show a weak correlation ($r(49)=0.459$ $p=0.001$), while the expressive ($r(49)=0.844$ $p<0.001$) and written communication domains ($r(49)=0.850$ $p<0.001$) show a strong correlation between the results of the two measures.

There is no correlation in the total amount of school communication.

In the dimensions we recorded correlation between the two measures in case of partners in the amount of interactions with "other adults" ($r(50)=0.276$ $p=0.05$), in case of functions in the function of requesting information/clarification ($r(50)=0.837$ $p<0.001$), in case of roles in the role of initiation ($r(50)=0.392$, $p=0.004$), in case of forms in one-word expressions ($r(50)=0.626$ $p<0.001$), two-word expressions ($r(50)=0.358$ $p=0.01$), AAC-use ($r(50)=0.552$ $p<0.001$), gestures ($r(50)=0.401$ $p=0.004$), and eye contact ($r(50)=0.357$ $p=0.01$), we registered a cooccurrence between the two studies.

In terms of dimensional variation, between the two measures there is also a correlation in terms of variety of the form ($r(49)=0.558$ $p<0.001$), function ($r(49)=0.428$ $p=0.002$) and partner ($r(49)=0.431$ $p=0.002$) dimensions.

In the comprehensive expressive communication and in many aspects of school communication, a correlation between the two measures can be confirmed.

6.2.2. THE COMPREHENSIVE LEVEL OF COMMUNICATION IS RELATED TO THE ENVIRONMENTAL FACTORS AND DIFFERENT INDIVIDUAL ABILITIES AND CHARACTERISTICS OF PUPILS WITH AUTISM AND COMPLEX COMMUNICATION NEEDS WHO RECEIVE INTENSIVE AUTISM-SPECIFIC EDUCATION

(Stone & Caro-Martinez, 1990; Cuccaro, Wright, Rownd, Abramson, Waller & Fender, 1996; Tsatsanis, Dartnall, Cicchetti, Sparrow, Klin & Volkmar, 2003; Kanne et al., 2011; Maljaars, Noens, Jansen, cholte & van Berckelaer-Onnes, 2011; Ganz, 2014; Ellis Weismer & Kover, 2015; Pickles, Anderson, & Lord, 2014; Thurm, Manwaring, Swineford, & Farmer, 2015; Little & Akin-Little, 2016; Fantuzzo, Tighe & Childs, 2000; Walker, Wilkins, Dailaire, Sandler, & Hoover-Dempsey, 2005; Sievers, Trembath & Westerveld, 2018).

2.a The comprehensive level of communication recorded at first and changes in communication are positively related with the comprehensive intellectual performance of pupils with autism and complex communication needs.

LEVEL⁸: The Leiter-R IQ (N=34) correlates and, according to the linear regression statistics, it is predictive of the overall communication level of the VABS ($r(32)=0.309$ $p=0.028$) ($R^2=7\%$; $F(1,32)=5.157$ $p=0.003$; $\beta=33.386$ $p<0.001$); the receptive domain level ($r(32)=0.408$ $p=0.017$) ($R^2=14\%$; $F(1,32)=6.384$ $p=0.017$; $\beta=0.174$ $p=0.017$), the expressive domain level ($r(32)=0.461$ $p=0.006$) ($R^2=19\%$; $F(1,32)=8.631$ $p=0.006$; $\beta=0.241$ $p=0.006$) and also of the level of the written domain ($r(32)=0.566$ $p<0.001$) ($R^2=30\%$; $F(1,32)=15.048$ $p<0.001$; $\beta=0.160$ $p<0.001$).

According to the results of the IQ classification (N=51) it also correlates with and according to the regression analysis results it is predictive of the overall communication level of the VABS ($r(49)=0.618$ $p<0.001$) ($R^2=49\%$; $F(4,46)=12.874$ $p<0.001$; $\beta=15.681$ $p<0.001$), the receptive domain level

⁸ By level, in each case, we mean the quantitative and qualitative variables shown in the first measure

($r(49)=0.477$ $p<0.001$) ($R^2=35\%$) ($R^2=35\%$; $F(5,45)=6.262$ $p<0.001$; $\beta=5.982$ $p<0.001$), the expressive domain level ($r(49)=0.561$ $p<0.001$) ($R^2=35\%$; $F(2,45)=6.314$ $p<0.001$; $\beta=6.512$ $p<0.001$) and the written domain level ($r(49)=0.503$ $p<0.001$) ($R^2=35\%$; $F(5,45)=6.33$ $p<0.001$; $\beta=2.653$ $p<0.001$).

The amount of school-communication are correlated intelligence (Leiter-R: $r(49)=0.372$ $p=0.031$; IQ_classification: $r(49)=0.332$ $p=0.017$) and its variety also (Leiter-R: $r(49)=0.401$ $p=0.019$; IQ_classification: $r(49)=0.328$ $p=0.019$). The results of the regression analysis show that Leiter-R scores are predictive of both the amount ($R^2=11\%$; $F(1,32)=5.143$; $p=0.031$ $\beta=0.472$ $p=0.031$) and variety of school-communication ($R^2=14\%$; $F(1,32)=6.140$ $p=0.019$; $\beta=0.226$ $p=0.019$). The classification of intelligence is also predictive of the amount ($R^2=25\%$ $F(4,46)=5.159$; $p=0.002$; $\beta=9.471$ $p=0.007$) and variety of school-communication ($R^2=8\%$; $F(4,46)=2.079$ $p=0.009$; $\beta=4.067$ $p=0.014$).

CHANGE: The IQ measured by Leiter-R is correlated with change in expressive communication ($r(32)=0.368$ $p=0.032$) and change in written communication ($r(32)=0.426$ $p=0.012$). The intelligence classification result is correlated with changes in expressive ($r(49)=0.346$ $p=0.013$) and written domains ($r(49)=0.552$ $p<0.001$) and with changes in total communication rawscore ($r(49)=0.284$ $p=0.044$).

None of the intelligence scores, however, show a correlation with changes in the amount and variety of school-communication.

It can be confirmed that the overall level of communication is related to the overall intellectual performance of pupils with autism and complex communication needs.

It can be partially confirmed that change in communication is related to overall intellectual performance of pupils with autism and complex communication needs: it can be confirmed in VABS but not in school communication.

2.b The overall level of communication recorded at first and changes in communication are positively related with the socio-economic status of pupils with autism and complex communication needs.

LEVEL: The HÉI is predictive of the level of the receptive domain in regression analysis ($R^2=35\%$ $\beta=-3.328$ $p=0.009$) with a non-significant inverse correlation.

There is an inverse trend-level correlation between the amount of school-communication and the HÉI ($r(48)=-0.291$ $p=0.039$), while the HÉI is predictive of the amount of communication in regression analysis ($\beta=-721$ $p=0.006$).

CHANGE: The HÉI is correlated with the change in the amount of school-communication ($r(48)=0.034$ $p=0.031$).

It can be partially confirmed that the overall level of communication at first is correlated with the socio-economic status of pupils with autism and complex communication needs: not in the expressive domain as measured in the VABS, but in the amount of school-communication.

2.c The overall level of communication recorded at first and changes in communication are positively related with the age of pupils with autism and complex communication needs.

LEVEL: In the regression analysis, age is predictive of receptive ($R^2=35\%$, $\beta=0.165$ $p=0.008$) and written domain levels ($R^2=35\%$; $\beta=0.083$ $p=0.011$) and of overall communication level ($R^2_{sum}=48\%$; $\beta=0.388$ $p=0.002$) of the VABS.

CHANGE: The age of pupils does not correlate with changes in communication in the VABS, nor with changes in the amount and variety of interactions observed in school-communication.

It can partially be confirmed on this sample that the overall level of communication is correlated with the age of the pupils.

It cannot be confirmed on this sample that changes in communication are related to the age of pupils.

2.d The overall level of communication recorded at first is positively related with the level measured in the social and independence domains and maladaptive behaviours domain of pupils with autism and complex communication needs. ⁹

Both expressive ($r(49)=0.467$ $p=0.001$) and aggregated communication level ($r(49)=0.550$ $p<0.001$) are correlated with the level of daily living domain. The socialization subscale correlate with the levels on the expressive subscale ($r(49)=0.383$ $p=0.006$) and the aggregated communication ($r(49)=0.370$ $p=0.008$). The results of the regression analysis show that the overall level of communication is a significant predictive factor for the level of daily living ($R^2=30\%$; $F(2,48)=11.638$ $p<0.001$; $\beta=0.260$ $p<0.001$) and socialization ($R^2=30\%$; $F(2,48)=3.873$, $p=0.028$; $\beta=0.112$ $p=0.001$).

No correlation was found between communication and the maladaptive behaviour domain. The level of school-communication (quantity and variety) is not related to adaptive behaviour domains and the level of maladaptive behaviours.

The correlation of overall communication with the level of socialisation and daily living skills can be confirmed based on the VABS results.

Correlation between the level of school-communication and the level of socialisation and daily living skills cannot be confirmed.

Correlation with the level of maladaptive behaviour based on any of the communication results cannot be confirmed.

2.e The overall level of communication measured at first and change in communication are positively related with changes measured in other areas of adaptive behaviour and negatively with maladaptive behavior in case of pupils with autism and complex communication needs.

LEVEL The aggregated communication level is predictive of changes in socialization ($R^2=15\%$; $F(2,48)=5.595$, $p=0.007$; $\beta=0.203$ $p=0.002$) and daily living domains ($R^2=16\%$; $F(2,48)=5.312$ $p=0.008$; $\beta=0.213$ $p=0.002$). The level of expressive communication is predictive of changes in the daily living subscale ($R^2=14\%$; $F(4,46)=3,013$, $p=0,027$; $\beta=0,363$ $p=0,012$).

The level of school communication does not relate to changes in adaptive behavioural domains.

CHANGE: The overall change in the communication subscale is strongly correlated with the changes in the daily living ($r(49)=0.413$ $p=0.003$) and socialisation subscales ($r(49)=0.418$ $p=0.002$). Change in aggregate communication, according to the regression analysis, is predictive of change in socialization ($R^2=15\%$; $F(2,48)=5.594$ $p=0.007$; $\beta=0.203$ $p=0.002$) and daily living domain ($R^2=15\%$; $F(2,48)=5.312$ $p=0.008$; $\beta=0.213$ $p=0.002$). Change in expressive communication correlates with change in socialization ($r(49)=0.326$ $p=0.021$).

No relation was found between change in communication and change in maladaptive behaviours.

Change in school communication is not correlated with change in adaptive behavioural domains.

According to the VABS results, it can be confirmed that the level and change ofl communication relates to the changes of socialisation and daily living skills. It cannot be confirmed that the level and changes of school communication relates to the changes in socialisation and daily living skills.

No relation can be confirmed with changes in maladaptive behaviour based on any of the levels and changes in communication variables.

⁹ In addition to the overall VABS communication score, the domain of expressive communication is included in the (2e, 2d) hypothesis-testing, and the results of the receptive and written domains are discussed in the results section of the dissertation (See Chapter 9).

2.f The overall level of communication recorded at first and changes in communication are positively related with the autism-specific quality of the educational environment of pupils with autism and complex communication needs.

LEVEL: The level of overall communication seen in VABS is not related to the quality of the educational environment.

The quality of the school environment shows a tendency-valued correlation with the amount of communication ($r(49)=0.287$ $p=0.041$). Regression analysis shows that the quality of the school environment is predictive of the amount of communication ($R^2=15\%$; $F(4,46)=5.169$ $p=0.002$; $\beta=12.836$ $p=0.015$).

CHANGE: The changes in communication in the VABS results are not related to the quality of the educational environment.

The change of variation in school communication shows a tendency-valued correlation with the quality of the educational environment ($r(49)=0.293$ $p=0.037$).

It can be partially confirmed (based on the amount of school-communication) that the overall level of communication recorded at first is related to the autism-specific quality of the educational environment of pupils with autism and complex communication needs.

It can be partially confirmed (based on the variation of school communication) that changes in communication are related to the autism-specific quality of the educational environment of pupils with autism and complex communication needs.

It cannot be confirmed that the overall level of communication seen in VABS and the change in communication are related to the autism-specific quality of the educational environment of pupils with autism and complex communication needs.

6.2.3. THE OVERALL LEVEL AND CHANGE OF SCHOOL COMMUNICATION IS POSITIVELY RELATED TO THE OVERALL LEVEL AND CHANGE IN COMMUNICATION AS MEASURED BY THE VABS

(Carter et al., 1998; Bölte & Poustka, 2002; Charman, Pickles, Simonoff, Chandler, Loucas, & Baird 2011; Howlin, Savage, Moss, Tempier & Rutter, 2014).

LEVEL: Variety of school-communication is predictive of the overall communication level of the VABS ($R^2=31\%$; $F(4,46)=6.649$ $p<0.001$; $\beta=0.491$ $p=0.018$).

The amount of school-communication is correlated with the level of expressive ($r(49)=0.381$ $p=0.006$), written ($r(49)=0.319$ $p=0.022$) and aggregated communication ($r(49)=0.361$ $p=0.009$) of the VABS.

Variety of school-communication correlates with the level of expressive ($r(49)=0.391$ $p=0.005$), written ($r(49)=0.336$ $p=0.016$) and aggregated communication ($r(49)=0.363$ $p=0.009$) of the VABS.

CHANGE: Changes of the amount of school-communication are not related to the quality of communication seen in VABS.

The variation of the variety of school communication shows a significant, tendency-valued correlation ($r(49)=0.280$ $p=0.046$) with the level of expressive domain.

It can be confirmed that the quality of school-communication is related to the quality of overall communication as measured in the VABS.

It can be partially confirmed that the level of communication in the VABS (only in the expressive domain) is related to the level of school-communication (only in the variety domain).

It cannot be confirmed that changes in school communication are related to changes in communication as measured by VABS.

6.3 HYPOTHESES ABOUT AAC-USE

We presented our results in subsection 11.3.3 and discussed them in detail in chapter 12 of the dissertation.

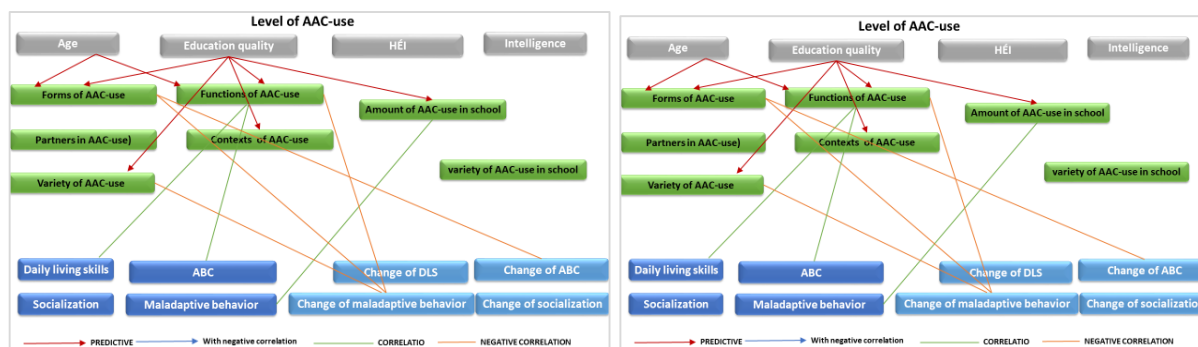


Figure 3: The associations of AAC-use

6.3.1. THE AAC-USE OF PUPILS WITH AUTISM AND COMPLEX COMMUNICATION NEEDS WHO RECEIVE INTENSIVE AUTISM-SPECIFIC EDUCATION SHOWS A CHANGE OVER A SIX-MONTH PERIOD

(van der Meer & Rispoli, 2010; Tincani & Devis, 2011; Ganz, Davis, Lund, Goodwyn, & Simpson, 2012; Still, Rehfeldt, Whelan, May, & Dymond, 2014; Schlosser & Koul, 2015; Nunes, 2015; Logan, Iacono, & Trembath 2017).

1.a The level of AAC-use develops over a six-month period.

The amount of AAC interactions at school does not show significant differences between the two studies. We recorded a statistically significant ($T=4$ $p=0.034$ $Z=-2.121$) increase main category of dyadic functions in the individual dimensions. There was a significant increase ($T=11$ $p>0.001$ $Z=-3.972$) in the overall school AAC variability.

The increase in the use of objects ($\chi^2(1)=10.243$ $p=0.001$) and gestures ($\chi^2(1)=8.957$ $p=0.003$) is statistically significant in the AAC questionnaire results. In the partners dimension, the increase in AAC-use with parents ($\chi^2(1)=11.063$ $p=0.001$) and other adult family members ($\chi^2(1)=11.959$ $p=0.001$), also with siblings ($\chi^2(1)=6.168$ $p=0.013$), and with adult partners who are strangers ($\chi^2(1)=9.667$ $p=0.002$) is statistically significant. In the functions dimension, increase in AAC-use for asking for objects ($\chi^2(1)=3.881$ $p=0.049$), asking for help ($\chi^2(1)=6.572$ $p=0.01$), refusing ($\chi^2(1)=12.756$ $p<0.001$), and responding ($\chi^2(1)=4.366$ $p=0.037$) is significant. On the dimension of contexts, the increase in AAC-use in different settings of school life ($\chi^2(1)=9.481$ $p=0.002$), home settings ($\chi^2(1)=2.147$ $p=0.001$) and different out-of-home programs organized by the family ($\chi^2(1)=2.147$ $p=0.039$) is statistically significant. The increase in the overall variation in AAC-use ($T=148$ $p=0.001$ $Z=-3.236$) and the increase of the variation of functions is significant ($T=25.5$ $p<0.001$ $Z=-4.44$).

An increase in the frequency of AAC-use over the six-month period cannot be confirmed.

It can be proved, in several dimensions of AAC-use and based on the positive change of AAC variety, that the quality of AAC-use developed over the six-month period.

1.b The level of AAC-use recorded at first measurement is positively related with the level of AAC-use measured six months later.

The amount of interactions with AAC at school is correlated between the two measures ($r(32)=0.837$ $p<0.001$). The amount in the learning situation ($r(32)=0.529$, $p=0.002$) and in the free-time situation ($r(32)=0.673$ $p<0.001$) is also correlated.

The amount of use of pictures in the AAC tool ($r(32)=0.581$ $p<0.001$) and the amount of initiation in the roles ($r(32)=0.783$ $p<0.001$) correlates between the two measures. In the forms with AAC-use, a correlation is registered between two-word expressions ($r(32)=0.742$ $p<0.001$), eye contact use ($r(32)=0.743$ $p<0.001$) and gaze switch ($r(32)=0.425$ $p=0.014$); in functions, a correlation is registered between the main functions of behavioral control functions ($r(32)=0.371$ $p=0.033$).

In addition to the overall variability ($r(40)=0.49$ $p=0.001$) in the AAC questionnaire results, and the variability of all dimensions is correlated between the two studies: form ($r(40)=0.332$ $p=0.034$), function ($r(40)=0.480$ $p=0.001$), partner ($r(40)=0.433$ $p=0.005$), and context ($r(40)=0.412$ $p=0.001$).

Our hypothesis can be confirmed: both in AAC-use at school and in the AAC-use questionnaire results, correlation can be registered between the two measures in several categories.

6.3.2¹⁰. LEVELS AND CHANGES OF AAC-USE ARE RELATED TO LEVELS AND CHANGES MEASURED BY PROCEDURES THAT COMPREHENSIVELY ASSESS THE COMMUNICATION OF PUPILS WITH AUTISM AND COMPLEX COMMUNICATION NEEDS WHO ARE RECEIVING INTENSIVE AUTISM-SPECIFIC EDUCATION

(Schlosser & Wendt, 2008; Nunes, 2008; Yoder & Stone, 2006 a,b; Millar, 2009; Tincani & Devis, 2011; Barlow, Tiger, Slocum, & Miller, 2013; Vivanti, Prior, Williams & Dissanayake, 2014; Light & Mcnaughton, 2015; Sievers, Trembath & Westerveld, 2018; Ganz & Simpson, 2019).

2.a The level of AAC-use recorded at first measure is positively related with the level and change of the communication of pupils with autism and complex communication needs, as well as with the level and change of speech.

LEVEL-LEVEL: The amount of AAC-use at school is negatively correlated with the variability of all school communication ($r(26)=-0.433$ $p=0.019$). The amount of AAC-use beside an inverse correlation ($r(26)=-0.525$ $p=0.003$) is predictive of the level of expressive communication measured in the VABS ($R^2=31\%$; $F(5,37)=7.311$ $p=0.003$; $\beta=-0.404$ $p=0.052$). The variability of AAC-use at school is positively correlated with the level of receptive ($r(26)=0.386$ $p=0.039$), expressive ($r(26)=0.508$ $p=0.005$) domains and aggregated communication ($r(26)=-0.401$ $p=0.031$) in the VABS.

In the results of the AAC-use questionnaire, the amount of functions related with AAC, correlates with the overall level of the VABS expressive ($r(40)=0.374$ $p=0.014$) and communication subscales ($r(40)=0.336$ $p=0.019$). The amount of AAC-functions show a tendency-valued correlation ($r(40)=0.294$ $p=0.051$), and is predictive of the level of speech measured in the school ($R^2=23\%$) ($F(5,37)=3.531$ $p=0.011$; $\beta=12.451$ $p=0.023$).

LEVEL-CHANGE: The level of AAC-use at school is not related to the changes of overall communication. In the results of the AAC-use questionnaire, AAC forms ($r(40)=-0.408$ $p=0.007$), AAC-use contexts ($r(40)=-0.301$ $p=0.051$) and AAC-variety ($r(40)=-0.343$ $p=0.024$) show inverse correlations with changes in the receptive communication domain of the VABS.

¹⁰ The written communication domain of the VABS is not included in the hypothesis-testing, the results are presented in the results of chapter 11.3.3 of the dissertation.

CHANGE-CHANGE: Change of the amount of AAC-use at school is correlated with ($r(26)=0.485$ $p=0.004$) and predictive of the change of the amount of overall school communication ($R^2=16\%$; $F(2,30)=4.637$ $p=0.018$; $\beta=1.379$ $p=0.005$).

Change in functions implemented with AAC is predictive of change in speech use ($R^2=15\%$; $F(5,37)=2.501$ $p=0.048$; $\beta=-9.285$ $p=0.041$).

In the results of the AAC-use questionnaire, an increase in the variability of AAC-use correlates with a change of VABS in the receptive ($r(46)=0.813$ $p<0.001$) and expressive ($r(46)=0.443$ $p=0.002$) domains.

It can be confirmed that the level of AAC-use recorded at first is related to the level of communication of pupils with autism and complex communication needs.

It can be partially confirmed (based on the functions) that the level of AAC-use recorded at first is related to the level of speech of pupils with autism and complex communication needs.

No correlation can be confirmed between the level of AAC-use recorded at first and changes in expressive and overall communication.

It can be confirmed that change in AAC-use is related to change in the overall communication of pupils with autism and complex communication needs.

It can partially be confirmed (based on the functions) that the level of AAC-use recorded at first is related to the change in the speech of pupils with autism and complex communication needs.

2.c The level of AAC-use recorded at first is positively related with the level of communication measured 6 months later.

The amount of AAC-use at school shows an inverse, weak correlation ($r(27)=-0.356$ $p=0.051$), and is predictive of the receptive domain ($R^2=22\%$; $F(2,26)=4.989$ $p=0.015$; $\beta=-0.263$ $p=0.051$). AAC-variability is correlated with ($r(27)=0.409$ $p=0.027$) and predictive of the receptive domain ($R^2=22\%$; $F(2,26)=4.989$ $p=0.015$; $\beta=1.535$ $p=0.028$).

The level of AAC-use at school recorded at first measurement is not related to the level of expressive communication showed six months later.

In the AAC-use questionnaire results, the amount of functions realized with AAC is correlated with the raw scores for aggregated communication ($r(40)=0.312$ $p=0.041$) and expressive domain ($r(40)=0.371$ $p=0.014$) in the VABS end-of-school-year measure, and with the level of speech in school communication ($r(40)=0.333$ $p=0.29$). The level of AAC-use contexts correlates with the overall level of school communication six months later ($r(40)=0.348$ $p=0.022$).

The level of variation in AAC-use shows stronger correlations also with the receptive ($r(40)=0.793$ $p<0.001$) and expressive ($r(40)=0.735$ $p<0.001$) domains of overall communication variation recorded in the second school observation ($r(40)=0.488$ $p=0.001$).

It can be partially confirmed (based on the AAC questionnaire results) that the level of AAC-use recorded at first predicts the level of overall communication measured 6 months later.

6.3.3. CHANGES IN AAC-USE ARE RELATED TO THE DIFFERENT ENVIRONMENTAL FACTORS AND DIFFERENT INDIVIDUAL ABILITIES AND CHARACTERISTICS OF PUPILS WITH AUTISM AND COMPLEX COMMUNICATION NEEDS WHO RECEIVE INTENSIVE AUTISM-SPECIFIC EDUCATION

(Tager-Flusberg, Paul & Lord, 2005; Chiang, 2008; Flippin, Reszka & Watson, 2010; Maljaars, Noens, Jansen, Scholte & van Berckelaer-Onnes, 2011; Ganz, Earles-Vollrath, Mason, Rispoli, Heath & Parker, 2011; Ganz, Davis, Lund, Goodwyn & Simpson, 2012; Ronski, Sevcik, Barton-Hulsey & Whitmore, 2015; Ganz, 2015; Heath, Ganz, Parker, Burke & Ninci, 2015; Sievers, Trembath & Westerveld, 2018; Donato, Spencer & Arthur-Kelly, 2018).

3.a The level of AAC-use recorded at first measurement and changes in AAC-use are positively related with the overall intellectual performance of pupils with autism and complex communication needs.

According to our analyses, our results on the level and variability of AAC-use show no relation to either the results of the Leiter-R measure, nor the results obtained with the intelligence classification.

Our hypothesis was not confirmed: the level of AAC-use recorded at first and the change in AAC-use are not related to the overall intellectual performance of pupils with autism and complex communication needs.

3.b The level of AAC-use recorded at first and changes in AAC-use are positively related with the socioeconomic status of pupils with autism and complex communication needs.

LEVEL: Our analysis shows that our results on the level of AAC-use does not correlate to the HÉI.

CHANGE: The HÉI correlates with ($r(31)=0.426$ $p=0.013$) and is predictive of changes in the amount of AAC interactions observed in school communication ($R^2=16\%$; $F(1,31)=6.891$ $p=0.013$; $\beta=3.957$ $p=0.013$).

It cannot be confirmed that the level of AAC-use recorded at first is related to the socio-economic status of pupils with autism and complex communication needs.

It can partially be confirmed (in terms of the amount of AAC-use at school) that changes in AAC-use are related to the socio-economic status of pupils with autism and complex communication needs.

3.c The level of AAC-use recorded at first and changes in AAC-use are positively related with the age of pupils with autism and complex communication needs.

LEVEL: In the AAC-use questionnaire age correlates with and shown to be a predictive factor of AAC forms ($r(40)=0.384$ $p=0.011$) ($R^2=13\%$; $F(1,41)=7.095$ $p=0.011$; $\beta=0.025$ $p=0.011$); and of AAC functions ($r(40)=0.372$ $p=0.014$) ($R^2=12\%$; $F(1,41)=6.577$ $p=0.014$; $\beta=0.041$ $p=0.014$).

CHANGE: Age is negatively correlated ($r(46)=-0.463$ $p=0.002$) and predictive of change in variation recorded in the AAC-use questionnaire ($R^2=19\%$; $F(1,39)=10.631$ $p=0.002$; $\beta=-0.470$ $p=0.002$).

It can partially confirmed (through the questionnaire's forms and functions) that the level of AAC-use recorded at first is correlated with the age of pupils with autism and complex communication needs.

It can partially confirmed (through the variability of the questionnaire) that changes in AAC-use is related to the age of pupils with autism and complex communication needs.

3.d Levels of AAC-use recorded at first and changes in AAC-use are positively related with levels measured in the social and daily living skill domains and negatively related with maladaptive behaviour domain of pupils with autism and complex communication needs.

LEVEL: The amount of AAC-use functions obtained in the first measure correlates with the ABC ($r(46)=0.316$ $p=0.041$) and with the level of the daily living domain ($r(46)=0.339$ $p=0.028$).

The amount of AAC-use at school obtained in the first measure was inversely correlated with the maladaptive behaviour domain score of the first measure ($r(31)=0.395$ $p=0.034$).

CHANGE: No relation was found between changes in AAC-use and in the levels measured in social and DLS domains of VABS and the maladaptive behaviours domains.

It can be confirmed that the level of AAC-use recorded at first is related to the levels measured in AAC-use in the domains of daily living skills and maladaptive behaviours of pupils with autism and complex communication needs.

It cannot be confirmed that the level of AAC-use recorded at first is related to the levels measured in social functioning of pupils with autism and complex communication needs.

It cannot be confirmed that the change in AAC-use is related to the levels measured in social and independence domains and maladaptive behaviours of pupils with autism and complex communication needs.

3.e The level of AAC-use recorded at first and changes in AAC-use are positively related with changes measured in other domains of adaptive behaviour and negatively related with maladaptive behavior-change of pupils with autism and complex communication needs.

LEVEL: In the AAC-use questionnaire results, AAC-use patterns show an inverse correlation with change in maladaptive behaviours ($r(46)=-0.323$ $p=0.035$). Quantity of features ($r(46)=-0.314$ $p=0.041$) and variation in AAC-use ($r(46)=-0.0345$ $p=0.024$) show an inverse correlation with change in maladaptive behaviours.

The level of AAC-use at school is not related to change measured in other domains of adaptive behaviour.

CHANGE: In correlation and regression analyses, no correlation was found between change in AAC-use and change in adaptive behavioural domains.

It can partially be confirmed that the level of AAC-use recorded at first is related to the change measured in the maladaptive behavior domains of pupils with autism and complex communication needs.

It cannot be confirmed that the level of AAC-use recorded at first is related to changes measured in the domains of daily living and socialisation of pupils with autism and complex communication needs.

It cannot be confirmed that change in AAC-use is related to change measured in other domains of adaptive behaviour of pupils with autism and complex communication needs.

3f. The level of AAC-use recorded at first and changes in AAC-use are positively related with the autism-specific quality of the educational environment of pupils with autism and complex communication needs.

LEVEL: In the AAC questionnaire results, the quality of the educational environment is correlated and predictive of AAC-forms ($R^2=13\%$; $F(1,41)=7.194$ $p=0.011$; $\beta=0.710$ $p=0.011$), AAC-functions ($r(40)=0.374$ $p=0.014$) $R^2=14\%$; $F(1,41)=6.664$ $p=0.014$); $\beta=1.172$ $p=0.014$), AAC-contexts ($r(40)=0.344$ $p=0.024$) ($R^2=9\%$; $F(1,41)=5.451$ $p=0.025$; $\beta=1.084$ $p=0.025$) and AAC-use variation ($r(40)=0.374$ $p=0.014$) ($R^2=10\%$; $F(1,41)=5.503$ $p=0.024$; $\beta=10.494$ $p=0.024$).

It is correlated with the amount of AAC-use at school ($r(26)=0.443$ $p=0.016$) and it is predicted by the level of quality of the educational environment ($R^2=17\%$; $F(1,27)=6.594$ $p=0.016$; $\beta=7.811$ $p=0.016$). CHANGE: The level of the educational environment, negatively correlates ($r(46)=-0.405$ $p=0.004$), and is predictive of changes in AAC forms ($R^2=15\%$; $F(1,46)=9.011$ $p=0.004$; $\beta=-1.231$ $p=0.004$).

It can be confirmed, based on a number of variables that the level of AAC-use at first is related to the autism-specific quality of the educational environment of pupils with autism and complex communication needs.

In part (through the AAC-forms), it can be confirmed that change in AAC-use is related to the autism-specific quality of the educational environment for pupils with autism and complex communication needs.

7. Conclusions

Our results were obtained on a larger sample of a relatively homogeneous group (in terms of language, intellectual performance and adaptive behavioural levels, as well as age). The provision of pupils was found to be unsatisfactory in terms of the educational environment.

Expressive communication, as a “lagging area”, needs special and intensive support. Communication and AAC-use are also developing in the high support needs group with complex communication needs. AAC is present in the children’s lives, but the pupils are showing the initial steps of AAC-use, that is to say this mode does not fulfil its role of providing broad participation in communication as a more abstract form of communication. There is a link between the use of AAC and comprehensive communication, but there are different patterns and ‘relation-networks’ in the details.

All in all, we saw similar communication and AAC-use profiles in the beginning and end-of-school year measures, which showed that pupils are in the early stages of social communication, and they only use confidently the initial steps of AAC. It seems that what AAC is ‘unique’ in (more abstract messages, language substitution role) is still lacking. The two school-based measures of AAC-use depicts a stable profile with individual differences, but no major outliers. If we consider that with the observation of school situations we monitored a ‘usual’ AAC-use and with the the questionnaire we monitored the ‘best AAC-use’, the significant difference in the variety of the dimensions suggests that there is a gap between ‘usual’ and ‘best or wished’ AAC-use.

Strong pedagogical implications can be drawn from our results. Structured learning situations are a good starting point to enhance communication, but systematic scaffolding of communicative competence (Mesibov, Shea and Schopler, 2009) is essential, because their spontaneous emergence and flexible generalization cannot be expected. The construction of individual dimensions and situations in smaller steps and their interconnection offers the possibility of development through individualized, specific and operationalized goals. To use communication in a way that ensures real participation, the intervention must move away from a world of simple action forms, behaviour regulation functions, passive response, communication with a narrow variety of partners, and the traditional teacher-led, instruction-based school communication (apart from when necessary) must be consciously reduced. To enhance communication both children and professionals require to move out of their daily routines. As professionals, out of our educational ‘comfort zone’, creating balance between building up situations that offer opportunities for the new, functional communication and

the apparent contradictions of the emotionally safe situations desired in an autism-friendly environment (Watson, Lord, Schaffer & Schopler, 1989, Rowland & Schweigert, 2004; Quill & Stansberry Brusnahan, 2017). On the practitioner side, there appears to be a need to understand the goals of longer-term functional benefits of AAC, through increasing their methodological knowledge and professional competence in autism and AAC – prioritising the individualized, well-focused selection of 'curriculum' content and focus, increasing their knowledge and confidence in the use of techniques for systematic intervention planning. It is essential that the decision-makers provide the necessary resources to ensure optimal conditions.

Our research presented in my dissertation faced several limitations, the most important of which are: the diverse, often divergent results of the available literature, on which it is more difficult to build questions and especially hypotheses, the overall small sample size (though relatively high compared to other researches on this population), the short follow-up period, the limited availability and lack of Hungarian standards for research/assessment instruments, the quantitative approach with data that is both 'too much for analysis and too little for interpretation', the sensitivity and difficulty to homogenise this group.

The results of our research and the changes that have taken place since then in the field of AAC in Hungary (e.g. the availability of AAC training courses, the appearance of AAC-literature in Hungarian, the establishment of national AAC tool lending institutions, the generalisation of mobile digital AAC tools) raise new questions. To answer these questions, further research seems essential.

On the one hand, further analysis of the research findings presented here is needed: for example, further splitting into groups, more systematic comparison of the communicative elements of each dimension and situation, deeper examination of the role of intervention methodology, more detailed mixed-methods analysis of individual outcomes, systematic analysis of the precise role of factors related to communication and AAC (which are mediator and moderator factors), and further investigation of factors related to speech development. On the other hand, our research would require a follow-up on the longer-term development of communication and AAC. (See Figure 4)

Thirdly, new research could extend (and compare) the results to different samples (e.g. groups of different ages, using more speech, with different atypical developmental groups), situations (moving towards home and everyday situations) or focuses (e.g. teaching techniques), even by repeatedly incorporating the methodology. New research should also explore the knowledge, attitudes, resources, competences and needs of professionals, parents and the wider social environment.

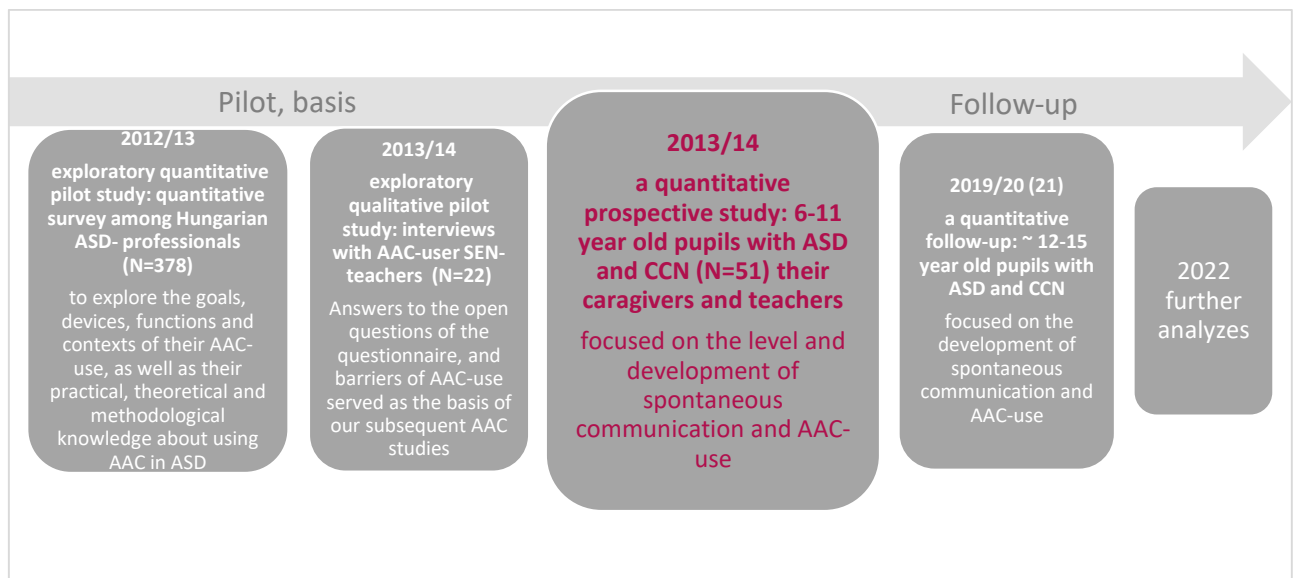


Figure 4: On the way of AAC research

On the basis of the profile of AAC-use that we have studied, it seems that the path to real participation, at the “end’ of which children with complex communication needs are given the opportunity to deliver more abstract messages with diverse purposes, partners and situations, using only (linguistic) symbols (Beukelman & Mirenda, 2013; Light & Mcnaughton, 2012; 2015; Light, McNaughton & Caron 2019), is still long, but the first steps are already visible.

‘With improved AAC research and evidence-based interventions, children and adults with complex communication needs will have the opportunity to live happy and fulfilled lives where they are able to participate fully in education, employment, health care, family, and community life; where they are safe and secure; where they are respected and valued for who they are; and where they have the opportunity to make meaningful contributions to society.’ (Light & Mcnaughton, 2015, p.93)

So this is the goal...

8. The author's most important publications on AAC

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