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AUGMENTATIVE AND ALTERNATIVE COMMUNICATION IN CHILDREN WITH AUTISM SPECTRUM DISORDER: AN EMPIRICAL STUDY OF COMMUNICATION OUTCOMES IN 30 BULGARIAN CHILDREN AGED 5–15

A CONTRIBUTION TO THE PSYCHOLOGY OF ATYPICAL COMMUNICATION DEVELOPMENT

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Ethical approval: The study was approved by an institutional ethics committee and conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from all legal guardians.
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Abstract: *Augmentative and Alternative Communication (AAC) has become one of the most evidence-supported intervention approaches for minimally verbal and non-verbal children with Autism Spectrum Disorder (ASD). The present study examined the effects of a six-month individualised, multimodal AAC intervention on the communicative competence of 30 children with ASD aged 5–15 years. A quasi-experimental single-group pre-test/post-test design was used. Three freely available, internationally validated instruments were applied — the Communication Matrix [1], the Communication Complexity Scale (CCS) [21] and Goal Attainment Scaling (GAS) [2]— supplemented by a PECS phase checklist and the Social Communication Questionnaire (SCQ) for baseline characterisation. Paired-sample analyses revealed statistically significant gains across all three primary measures, with the largest effects observed in intentional-symbolic communicative behaviour and in frequency of spontaneous requests. Age, non-verbal cognitive level and the intensity of parental involvement emerged as the strongest moderators of progress. The findings are consistent with international evidence showing that AAC does not inhibit speech development and actively supports expressive, social-pragmatic and behavioural functioning, and they add to the still limited Bulgarian empirical literature on AAC.*

Keywords: *autism spectrum disorder, augmentative and alternative communication, PECS, Communication Matrix, Communication Complexity Scale, developmental psychology, Bulgaria.*

Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition defined by persistent difficulties in social communication and interaction together with restricted, repetitive patterns of behaviour,

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interests or activities [3]. Current international epidemiological estimates place the prevalence at approximately one in thirty-six school-aged children [4], and Bulgarian clinical and educational data point to a comparable and rising rate of diagnosis over the past decade [5], [6].

Between 25% and 35% of individuals on the spectrum remain minimally verbal beyond the age of five, meaning that they either do not develop functional spoken language or use a very limited spoken repertoire for communication [7]. For these children, the absence of a reliable expressive modality is associated with increased frustration, higher rates of challenging behaviour, restricted academic access and reduced social participation. Augmentative and Alternative Communication — the clinical field that studies and applies any communication mode other than oral speech — offers a developmentally grounded and ethically necessary response to this gap [8].

AAC encompasses unaided modes (manual signs, gestures, vocalisations) and aided modes ranging from low-technology picture boards and communication books to high-technology speech-generating devices and tablet-based applications. A large body of international research — including two meta-analyses of intervention studies with children on the spectrum — converges on three conclusions: AAC produces medium-to-large gains in expressive communication [9], [10]; AAC does not suppress the emergence of spoken language and in many cases accelerates it [11]; and parent-mediated, naturalistic and multimodal approaches outperform clinician-only, decontextualised models [12].

Despite this international evidence base, AAC remains under-implemented in Bulgaria. Systematic parent surveys and clinical overviews indicate that access to aided AAC is uneven across regions, that many speech-and-language therapists lack specialised AAC training, and that a cultural preference for speech-only therapy persists among both professionals and families [13], [14], [15]. Bulgarian empirical studies with samples larger than ten children are few; the present investigation was designed to help fill this gap by evaluating AAC outcomes in a clinically representative sample of 30 children.

Theoretical Framework

The Participation Model of Communication

The conceptual foundation of contemporary AAC practice is Beukelman and Light's Participation Model [8], which frames communication as a right and as a prerequisite for meaningful life participation. The model distinguishes between opportunity barriers (policy, attitude, knowledge, skill) and access barriers (capabilities of the individual) and requires that intervention planning target both. Psychologically, this reframes the goal of therapy away from remediating a deficit in the child and toward restructuring the communicative ecology so that the child can take a legitimate conversational turn.

Developmental and Behavioural Models

Two further frameworks shape the empirical literature. The developmental social-pragmatic model (the SCERTS framework) [16] emphasises progression along a continuum from pre-intentional to intentional, from non-symbolic to symbolic, and from requesting to commenting and narrating. The behavioural-analytic tradition, most visibly expressed in the Picture Exchange Communication System [17], sequences acquisition through six empirically defined phases, from single-item exchange to complex sentence construction and commenting. Modern clinical practice in ASD integrates both traditions, a position also advocated by leading Bulgarian specialists in the field [13], [18].

Psycholinguistic rationale. From a psycholinguistic standpoint, AAC provides an external symbolic system that reduces the cognitive and motor-planning load associated with spoken output, allows the child to rehearse form–meaning mappings at a manageable pace, and exploits the relative strength in visual processing that has been documented in a substantial proportion of children with ASD [19], [17]. The visible, permanent and selection-based nature of aided AAC aligns with these processing profiles and offers a route to joint attention that does not depend on the fleeting acoustic signal of speech.

Research Aims and Hypotheses

The study pursued three aims: (a) to document change in communicative competence across a six-month individualised AAC intervention in 30 Bulgarian children with ASD aged 5–15; (b) to examine the contribution of child-level (age, non-verbal cognition, baseline communication level) and environmental (parental involvement, weekly AAC exposure) variables to outcomes; and (c) to contribute to the Bulgarian empirical literature on AAC by applying instruments that are internationally validated, freely available and replicable.

Three directional hypotheses were formulated:

H1. Children will show statistically significant gains on the Communication Matrix total score and on the Communication Complexity Scale from pre- to post-intervention.

H2. Goal Attainment Scaling scores will exceed the expected level ($T \geq 50$) in at least two thirds of cases.

H3. Younger age at intervention onset and higher weekly parental AAC involvement will each independently predict larger gains.

Method

The study was approved by an institutional ethics committee and conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from all legal guardians.

Design

A quasi-experimental single-group pre-test/post-test design was adopted. This design was chosen for ethical and practical reasons: withholding AAC from a waitlist control group of minimally verbal children was judged incompatible with the Participation Model. To strengthen internal validity, each child served as their own control, and Goal Attainment Scaling provided an individualised reference standard against which progress was measured.

Participants

Thirty children (21 boys, 9 girls; ratio 2.33:1, consistent with Bulgarian and international sex-ratio estimates in ASD [6]) were recruited through three specialist centres in Sofia and Plovdiv. Inclusion criteria were: (a) a formal diagnosis of ASD established under DSM-5 or ICD-11 criteria by a licensed child psychiatrist; (b) chronological age between 5 years, 0 months and 15 years, 11 months; (c) minimally verbal status, defined as fewer than 30 functional spoken words used spontaneously; (d) no uncorrected sensory impairment; (e) written informed consent from a legal guardian. Exclusion criteria were the presence of a degenerative neurological condition or concurrent participation in another AAC research protocol. The study was approved by the institutional ethics committee and conducted in accordance with the Declaration of Helsinki.

Sample characteristics are presented in Table 1.

Table 1. Demographic and clinical characteristics of the sample (N = 30).

Variable	M / n	SD / %	Range
Chronological age (years)	8.9	2.8	5.0–15.4
Boys / Girls	21 / 9	70% / 30%	—
Non-verbal IQ (Leiter-3, brief screener)	71.4	18.2	42–108
SCQ total (baseline)	21.7	4.3	16–32
Functional spoken words (baseline)	7.2	8.1	0–28
Prior AAC exposure (months)	2.4	3.8	0–14

Instruments

Communication Matrix [1]

The Communication Matrix is a standardised assessment developed at the Oregon Health and Science University and distributed free of charge through the online platform communicationmatrix.org. It places a child on a seven-level developmental continuum — from pre-intentional behaviour through abstract symbolic communication — across four communicative functions (refuse, obtain, social interaction, provide/seek information). The instrument has been used in more than 150 peer-reviewed studies and demonstrates adequate inter-rater reliability ($\kappa = .78–.91$). Because it is freely available, multilingual and appropriate for any age and any level of communicative functioning, it is particularly well-suited to ASD research in resource-constrained settings such as Bulgaria.

Communication Complexity Scale [20]

The CCS is a 12-point observational scale that quantifies the form, function and intentionality of a communicative act, ranging from 0 (no response) through 7 (pre-symbolic triadic communication) to 12 (multi-symbol combinations with clear joint attention). The scale is freely available in the original publication and has been explicitly designed for minimally verbal children with ASD and intellectual disability. Reported inter-rater reliability is high (ICC = .88). In the present study, two certified raters independently coded a 15-minute structured communication temptation probe.

Goal Attainment Scaling [2]

GAS is a criterion-referenced method that expresses individualised therapeutic goals on a five-point scale (−2 much worse than expected, −1 less than expected, 0 expected outcome, +1 better than expected, +2 much better than expected). Goals are defined collaboratively with the family before intervention and are scored blind at follow-up. Scores are converted to a standardised T-score (M = 50, SD = 10). GAS is widely used in paediatric rehabilitation and AAC research [11] and is freely available.

PECS Phase Checklist

Progress through the six phases of the Picture Exchange Communication System (Bondy & Frost, 2001) was recorded for each child using the criterion-referenced mastery checklist distributed in the original training manual. Although PECS itself is a trademarked programme, the developmental logic of its phase structure is openly described in the peer-reviewed literature and is used here descriptively.

Social Communication Questionnaire (SCQ) [21]

The SCQ (Lifetime form, 40 items, yes/no) was completed by parents at baseline to confirm ASD symptom severity. The established clinical cut-off of ≥ 15 was met by all 30 participants.

Intervention

The intervention was a six-month, individualised, multimodal AAC programme delivered at a rate of three 45-minute sessions per week plus daily parent-implemented practice. Each child received a bespoke communication system combining low-technology picture symbols (SymbolStix, distributed under the SAW licence for research and educational use) and a tablet-based speech-generating application. In addition, dedicated AAC software systems — C-Board AAC and Communicator 5 — were implemented as primary aided communication platforms, allowing for symbol-based message construction and voice output. Visual supports, including communication boards, schedules and symbol cards, were designed and customised using Boardmaker 7 and Boardbuilder, ensuring consistency across therapy and home environments. The therapeutic sequence integrated the PECS protocol [17] with SCERTS-aligned naturalistic opportunities [16]. Parents attended four structured 90-minute coaching sessions during the first month and received fortnightly home-based supervision thereafter. Fidelity of implementation was monitored by means of a 12-item therapist checklist; the mean fidelity score across sessions was 91.4%.

Procedure and Data Analysis

Baseline assessment was completed during the two weeks preceding intervention; post-intervention assessment was completed within two weeks of session 72. Two speech-and-language therapists certified in the Communication Matrix served as independent raters; discrepancies were resolved by consensus with a third senior clinician. Analyses were performed in JASP 0.18 using paired-samples t-tests for normally distributed variables and Wilcoxon signed-rank tests where assumptions were violated. Effect sizes were estimated using Cohen‘s d (or rank-biserial r for non-parametric tests). Pearson and Spearman correlations and a hierarchical multiple regression were used to test moderators. The significance threshold was set at $\alpha = .05$ (two-tailed).

Results

Pre-post change on primary measures. All 30 children completed the full protocol; there was no attrition. Paired-samples analyses indicated statistically significant gains on all three primary outcomes (Table 2). Effect sizes were large for the Communication Matrix and the Communication Complexity Scale and moderate-to-large for Goal Attainment Scaling.

Table 2. Pre-intervention and post-intervention scores on the primary outcome measures (N = 30).

Measure	Pre M (SD)	Post M (SD)	t / Z	Effect size
Communication Matrix (total /80)	28.4 (9.6)	46.1 (11.2)	t = 11.43***	d = 1.70
CCS (highest level, 0–12)	5.1 (2.0)	8.3 (2.1)	Z = 4.52***	r = .83
GAS T-score	—	56.7 (9.1)	t = 4.01*** (vs 50)	d = 0.74
Spontaneous requests (10-min probe)	1.8 (1.5)	7.4 (3.2)	t = 10.11***	d = 1.52
Functional spoken words	7.2 (8.1)	14.9 (13.6)	Z = 4.08***	r = .74

*Note. *** $p < .001$.*

These results indicate substantial improvements in both symbolic communication and communicative intentionality across the sample.

PECS Phase Progression

At baseline, 19 children (63%) were not functioning at any PECS phase, 7 (23%) were at Phase I (single-item exchange) and 4 (13%) were at Phase II (distance and persistence). After six months, no child remained below Phase I; 5 children (17%) reached Phase II, 11 (37%) reached Phase III (picture discrimination), 9 (30%) reached Phase IV (sentence structure), 4 (13%) reached Phase V (answering 'What do you want?') and 1 child reached Phase VI (commenting). Ten children (33%) used their AAC system in combination with emerging spoken word approximations by the end of the programme.

Moderators of Outcome

A hierarchical multiple regression predicting change on the Communication Matrix entered chronological age and non-verbal IQ at Step 1 ($R^2 = .28$, $F(2, 27) = 5.22$, $p = .012$) and weekly parent-implemented practice at Step 2 ($\Delta R^2 = .19$, $F(1, 26) = 9.32$, $p = .005$). The final model explained 47% of the variance. Younger age ($\beta = -.34$, $p = .021$) and higher parental involvement ($\beta = .46$, $p = .005$) were each significant independent predictors; non-verbal IQ did not reach significance once parental involvement was entered ($\beta = .18$, $p = .21$). This pattern replicates Kasari et al. [12] and Ganz et al. [9] and supports the clinical priority assigned to family coaching in the Participation Model.

Discussion

The present study provides converging evidence that a six-month, individualised, multimodal AAC programme produces clinically meaningful gains in the communicative competence of Bulgarian children with ASD aged 5–15 years. All three hypotheses were supported: (a) statistically significant pre-post gains were observed on the Communication Matrix, the CCS, functional spoken vocabulary, and the spontaneous-request probe; (b) GAS T-scores exceeded the expected level of 50 in 23 of 30 cases (77%); and (c) younger age and higher parental involvement independently predicted larger gains.

The magnitude of the effects (Cohen's d ranging from 0.74 to 1.70) is consistent with the ranges reported in the two major international meta-analyses of AAC with children on the spectrum [9], [10], and exceeds the effects typically reported for speech-only intervention in minimally verbal participants. Importantly, the increase in functional spoken words from M = 7.2 to M = 14.9 is incompatible with the persistent but empirically unsupported concern that introducing AAC will inhibit speech. Instead, the finding replicates the pattern documented by Schlosser and Wendt [11] and by Millar, Light and Schlosser [22]: aided AAC serves as a scaffold rather than a substitute for vocal development.

From a developmental-psychological perspective, the largest within-child shifts occurred in the transition from pre-intentional or contact-gesture communication to intentional, conventional and symbolic communication — that is, precisely along the axis that Rowland's Communication Matrix was designed to trace. This corroborates the theoretical claim, articulated in Bulgarian scholarship by Tsenova

[13] and internationally by Light and McNaughton [17] that the decisive psychological change AAC produces is not the acquisition of a device but the acquisition of communicative intentionality.

The moderator analysis highlights an ecological point that is central to Bulgarian clinical practice. Non-verbal IQ did not independently predict outcome once parental involvement was entered, echoing Kasari et. al [12] finding that the communicative environment is a more malleable and more powerful lever than child-intrinsic cognitive capacity. This has direct implications for the organisation of early-intervention services in Bulgaria, where access to parent-coaching programmes remains uneven [14], [18].

Limitations and Future Research

Four limitations qualify the findings. First, the absence of a randomised control group means that maturation and repeated-testing effects cannot be fully excluded, although the large effect sizes and the inclusion of individualised GAS goals provide partial protection. Second, the sample was recruited from urban specialist centres and may over-represent families with higher motivation and education; rural and lower-resource populations are likely to show different outcomes. Third, outcome measurement relied on standardised probes and parent questionnaires; direct generalisation probes in school and community settings were not systematically conducted. Fourth, the six-month follow-up window, although consistent with the AAC literature, does not allow conclusions about long-term maintenance.

Three directions are recommended for future Bulgarian research. The first is a multi-site randomised trial comparing AAC plus naturalistic speech intervention against naturalistic speech intervention alone, using the same freely available instruments applied here. The second is the adaptation and validation of the Communication Matrix and the CCS into Bulgarian with formal psychometric evaluation. The third is a longitudinal follow-up of the present cohort at 12 and 24 months to examine maintenance and the trajectory of spoken-language emergence. These limitations should be considered when generalising the findings to broader populations.

Conclusion

For 30 Bulgarian children with ASD aged 5–15 years, a structured six-month multimodal AAC intervention produced large and statistically significant gains in symbolic communication, communicative complexity, spontaneous requesting and functional spoken vocabulary, with individualised goals exceeded in roughly three quarters of cases. Younger age and parental involvement were the strongest predictors of progress. The results support the wider dissemination of AAC in Bulgarian clinical and educational settings and demonstrate that rigorous, replicable AAC research can be conducted with freely available, internationally validated instruments. Beyond its clinical implications, the study underscores a psychologically important claim: communication is a right, and the psychology of atypical communication development is, at its core, the psychology of how environments can be reorganised to honour that right. The findings support the systematic integration of AAC into early intervention and educational policy in Bulgaria.

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