

Scoping Review: Autism Research in Baltic States—What Is Known and What Is Still To Be Studied

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Abstract We conducted a scoping review of the current knowledge about autism in Baltic States: Lithuania, Latvia and Estonia. The aim was to identify publications about autism and potential gaps of knowledge in this region. The search was conducted on March 31, 2016 using PubMed, PsycINFO and EMBASE databases. The search was updated on August 31, 2016; a total of 47 studies were analysed. Current research on autism in Baltic States is still in its beginning. Areas studied were education, medicine, parenting, autism in adulthood, treatments and epidemiology. Education sector is the most researched discipline about autism in Baltic countries especially addressing issue on schooling practices for autistic children. The prevalence of autism is unclear as only one outdated epidemiological study was found. Further epidemiological, clinical intervention research need to be conducted in this region.

Keywords Autism · ASD · Lithuania · Latvia · Estonia · Research

Little is known about the current situation of autism in Baltic States as there is a lack of substantial research in this field across all three Baltic countries (Pūras et al. 2004; Querdenker and Meirhofer 2014; Mikulėnaitė and Ulevičiūtė 2004). Therefore, to investigate autism in this region, we decided to perform scoping review.

As part of the post-Soviet communist bloc, Estonia, Latvia and Lithuania all gained independence in 1990s (Slay 2009). With independence and sovereignty, economic, political and social sectors underwent significant changes. The post-Soviet countries moved from centrally planned economies¹ to capitalism, from autocracy to democracy and from social ‘equality’ to equity (Slay 2009). The existing view of mental health of that time was highly influenced by Moscow school of psychiatry, which concentrated on treatment with medicine and institutionalisation of patients with psychiatric disorders (Lesinskienė et al. 2008). Government did not recognise mental health problems and did not seek to integrate vulnerable people into society (Pūras et al. 2004). Moreover, treatment relied on a biological approach, with few non-pharmacological therapies offered. In addition, there was no family care or support provided by the government (Lesinskienė et al. 2008; Pūras et al. 2004).

Since the 1990s when the three Baltic countries gained independence, there appears to have been little change in the management of autism (Pūras et al. 2004; Querdenker and Meirhofer 2014). This may be caused by lack of awareness and comprehension of the condition, which is supported by the absence of integration of people with autism into regular schools. Although most health care professionals recognise autism and the diagnosis is made, few intervention programs have been introduced. Applied Behavioural Analysis (ABA) and Treatment and Education of Autistic and Communication-related handicapped Children (TEACCH) are the main intervention programs introduced for the parents, but the access is limited due to costs of services and lack of expertise in their administration in the Baltic countries (Krasauskaitė 2010;

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¹ “An economic system in which economic decisions are made by the state or government rather than by interaction between consumers and businesses” (Slay 2009).

Querdenker and Meirhofer 2014). According to Mansell and Morris (2004) ‘ABA is a process of modifying behaviour using antecedent stimuli and consequences’. Virues-Ortega et al. (2013) defined TEACCH as ‘an intervention program designed to assess and enhance individual’s abilities and skills’. Both programs are designed to help people with autism spectrum disorder.

The current scoping review was conducted with the aims to

- i) Describe the scope (i.e. amount, focus and nature) of research on autism across Baltic countries;
- ii) Summarise and disseminate main findings, settings and methodology across Baltic countries;
- iii) To identify the research gaps in the autism research across Baltic States.

Methods

The goal was to identify, retrieve and summarise the existing knowledge on autism in Baltic countries. The scoping review was chosen as main method for analysis because it is broader and more inclusive and it provides summaries of research findings more than the methods used to obtain them. The main phases of this scoping review were:

- Searching for relevant studies;
- Selecting studies based on pre-defined inclusion criteria;
- Extracting data;
- Collecting, summarising and reporting the results.

Data Sources and Search Strategy

The initial search was implemented on March 31, 2016, in three electronic databases PubMed (Medical Sciences, 1964–March 31, 2016), PsychINFO (Behavioural And Social Sciences 1966–March 31, 2016) and EBSCO (Multidisciplinary, 1900–March 31, 2016). Update search was conducted on August 31, 2016, when additional 17 studies were included.

These databases were chosen for a broad range and more inclusive studies across different disciplines. The search engine consists of the key terms: autism spectrum disorder and the countries name. Total of 67 articles in all the databases were found. After duplicates were deleted and the articles abstracts were read based on relevance of the study, only 10 articles remained. This small number of articles about autism in Baltic States in the databases suggests a low level of research on autism in the Baltic countries. Most of the studies are published under state universities that the researcher is affiliated with; therefore, articles are held in the university

electronic catalogue. In addition, majority of research in Eastern Europe is published in the language of the country it was performed and rarely translated into English language for international publication. The current study used Lithuanian, Latvian and Estonian national libraries and open access databases as also the databases of all universities in each country (Table 1).

The review was based on these search words: country, diagnosis and language. Article included patients with autism or people in close contact with patients like parents, teachers and siblings (Table 2). Studies were excluded if after reading the full text the study did not consist of any above-mentioned constructs. Lastly, if the study was found in couple of databases, only one paper was maintained.

The Study Screening Process

A two-stage process was used to scan the databases mentioned above. Firstly, title and abstracts of studies were reviewed to identify relevant studies ascending with searched constructs. The remaining articles were carefully read and full text analysis was performed. If the full text of the article was not available online, the author or university library was contacted for personal copy. If a copy was not obtained after that, article was excluded from the review. The remaining articles were reported in the results section of this scoping review (Fig. 1).

Inter-Rater Reliability of Reviewers

All papers were reviewed by two reviewers: A. Prasauskiene and R. Buivydaite, but kappa score was not extracted because of complexity of the data presented in the papers.

Procedure of Text Analysis

Each paper was read and the main findings of the paper were put in the Excel spreadsheet; then, the papers were grouped according to their topic. After thorough analysis of the grouped papers, the main findings emerged and were reported in the “Discussion” section.

Results

The results revealed that most of the research on autism started after 2005, as only three studies were found on autism by that time. Most of the studies, $N = 27$ were found in Lithuanian databases, $N = 9$ studies in Estonian and $N = 11$ studies in Latvian. Of the 15 unobtainable studies, 14 were from Latvia and one from Estonia. Majority of which consisted of Bachelor ($N = 6$) or Master ($N = 8$) thesis and $N = 1$ journal

Table 1 Country databases used in this review

Country	Library name	URL
Lithuania	Lituanistika	http://www.lvb.lt/primu_library/libweb/action/search.do
	Libis (National Bibliographic data bank)	http://nbdb.libis.lt/
	Vilnius University	http://www.mb.vu.lt/istekliai
Latvia	National Library of Latvia	http://www.lnb.lv/en/search
	Riga University	http://www.rsu.lv/eng/services/library
Estonia	National Library of Estonia	http://www.nlib.ee/en
	University of Tartu Library	https://utlib.ut.ee/

article. The types of publications were 45% of journal articles mainly published in local journals of medicine, health and education; remaining 55% were thesis (Bachelor, Masters, Doctoral) submitted in final years of studies. Research methods used in the studies were mainly cross-sectional (46%) comparing autism parents with parents of typically developing children or comparing children with autism with other children (typically developing or with developmental disorder); only few studies address questions of treatment and intervention for autism. Half of studies (51%) used parents of children with autism or professionals as their primary participants and only one third of the participants in the studies were children. Only one study used autistic adults as research participants (Table 3).

Discussion

Autism is a relatively new diagnosis in the practice of psychiatry and medicine across all three Baltic countries. It was introduced only in the early 1990, after the Soviet Union collapsed (Pūras et al. 2004). This scoping review revealed that research on autism is limited. Areas studied in the Baltic States were education, medicine, parenting, autism in adulthood, treatments and epidemiology; however, quality of research in these areas were poor (Table 4).

Table 2 Constructs searched across databases

Area of interest	Construct's searched
Country	Lithuan*, Lietuv*, Leed*, Latvia, Latvij*, Lāti, Estonia, Esti*, Igauni*, Eest*
Diagnosis	Autism, Autizm*, autism*, ASD, Autism Spectrum Disorder, Autizmo Spekro Sutrikim*, Autism Spectrum traucēj*, Autismi spektri hair*, Child Autism, Vaik* autism*, Bēru Autism, Lapse Autism, Visapusiš raid* sutrik*, Iespiedies attīstības traucējumi, Lābivad arengu hāire
Language	Lithuanian, Latvian, Estonian and English

Epidemiology

This review revealed that the epidemiology of the autism in this region is still not clear as only one study attempted to estimate the prevalence across three Baltic States. It was conducted in 1999 in Lithuania. During this study, 6018 school children in 14 randomly selected secondary schools and 252 classes in Vilnius District (Lesinskienė 2000). Out of 133 children found with diagnosis, 36 cases of Asperger's, 38 cases of moderate autism and 59 cases of severe autism. Research was conducted 17 years ago and requires updated results with wider Lithuanian population (Lesinskiene 2000).

No epidemiological studies were found in Latvia or Estonia. Therefore, the question of amount of help needed for families remains unaddressed (Querdenker and Meirhofer 2014).

Autism and Education

Different measurements were used to assess children with autism. There were questionnaires designed by the researchers to measure individual accomplishments and social behaviours of autistic children in school setting. Also, prior validation or psychometric properties of the designed questionnaires were not presented (Astrauskienė 2008; Priede 2009; Terje 2013). Whilst Psycho-Educational Profile (PEP) and Paediatric Evaluation of Disability Inventory (PEDI) tests were used to evaluate child's language and to assess independence skills, however, these tools were not validated in these populations (there were less studies assessing child's behaviour or well-being) (Kobolt 2010; Karen 2015; Tamošūnienė et al. 2012).

The characteristics of autism were studied in parallel with schooling experiences especially with the importance of school integration compared with special schools. The questionnaires were used to evaluate the child's abilities when using group work (Priede 2009), individual programs (Terje 2013; Adomaitienė and Jurevičiūtė 2014),

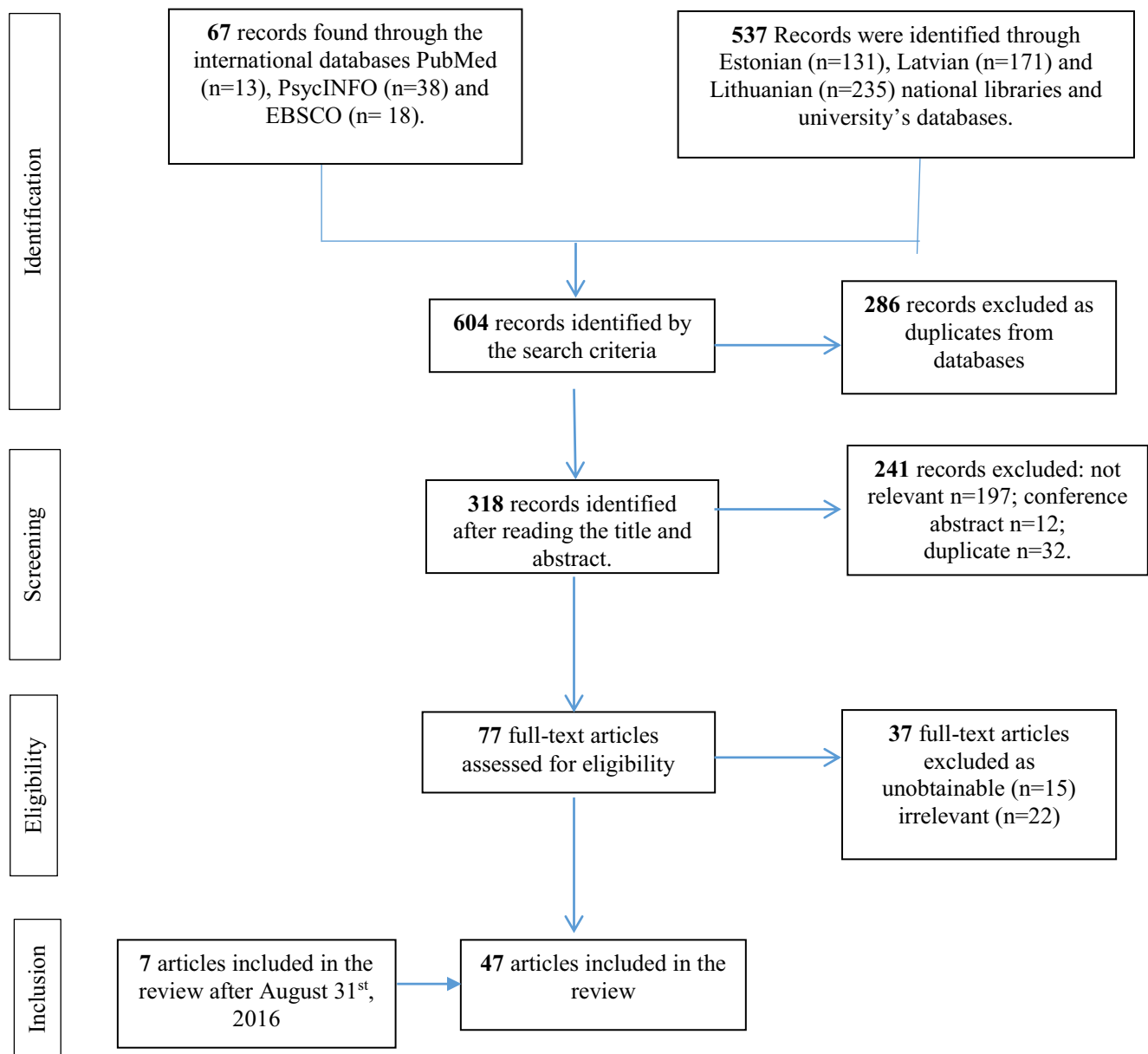


Fig. 1 Flowchart of article extractions

mathematical lessons (Elis 2015) and socialisation programs (Lelde 2016). Review revealed that children learn social norms more effectively in regular schools than special schools (Astrauskienė 2008; Ivonytė et al. 2009; Priede 2009; Karen 2015; Žaromskytė 2012; Baškienė 2015; Lelde 2016). Other studies claimed that adapted or special programs are less stressing for the child and more productive in process (Dekšeniec 2012; Medvedeva 2012; Pociūtė 2012; Tamošūnienė et al. 2012; Terje 2013; Adomaitienė and Jurevičiūtė 2014; Sarmite 2014; Vilkelienė and Kondrotienė 2015). Other developmental problems of children with autism were not studied in the Baltic countries. There is still a need for more elaborate studies on understanding the relevant educational practices for autistic

children in schools and teacher's experiences working with these children.

Medical Research

There were two genetic studies that concentrated on possible genetic causes of autism (Pentjuss et al. 2013; Bauze et al. 2014). And two studies concentrated on biological differences in autistic children (Keverer et al. 2009; Bauze et al. 2013a). One study compared frequency of hyperhomocysteinemia between schizophrenia and autism patients with results revealing that hyperhomocysteinemia is more common in autism than schizophrenia (Bauze et al. 2014). According to Guo et al. (2009), hyperhomocysteinemia is a

Table 3 Demographics of the records

Characteristics	Lithuania	Latvia	Estonia
Publication year (<i>n</i>)			
2005<	3	0	0
2005–2010	2	1	1
2011–2014	11	4	6
2015–March 31, 2016	3	0	2
March 31, 2016–August 31, 2016	7	6	0
Publication type (<i>n</i>)			
Journal article	17	3	0
Bachelor thesis	0	5	5
Master thesis	6	2	4
Doctoral thesis	3	1	0
Research type (<i>n</i>)			
Case study	3	1	3
Cross-sectional	12	6	3
Intervention	1	0	1
Qualitative (interviews)	6	1	1
Quasi-experimental	0	1	1
Systematic review	1	1	1
Mixed methods	2	1	0
Epidemiological study	1	0	0
Participants of the study (<i>n</i>)			
Children with autism	8	3	5
Adults with autism	0	1	0
Parents of children with autism	14	4	2
Professional working with people with autism	0	1	0
Mixed group—parents and professionals	3	1	1

congenital condition with an abnormally high level of homocysteine in the blood. The homocysteine is responsible for the vitamin B₆, B₉ and B₁₂ production in the body (Miller et al. 1994). Other study concentrated on anthropometric parameters and found that patients with autism were taller in height compared to typically developing (Bauze et al. 2013a). Four studies underlined lack of studies in biomarkers of autism across Baltic countries.

The review also highlighted interest in research on diets and digestion for autistic children in Baltic States. The study by Lesinskienė (2002) showed that children with autism suffer from digestion problems compared to typically developing, which was highly correlated with poor sleep. Moreover, studies by Loonum and Veldemann (2013) as also by Oie (2014) informed that diet interventions like glutamine or casein free are common practices amongst parents of children with autism. Above findings showed that dietary treatments is used to influence on child's development and behaviour, which is a common finding in Western research (Emond et al. 2010; Whiteley et al. 2010).

The review found limited studies on experience of medical services for children with autism. The studies revealed lack of

knowledge about autism amongst doctors in the emergency rooms (Lesinskienė et al. 2002b) and general practitioners (Pociūtė 2012). In addition, it highlighted the need to provide adapted medical services and home visits for families with autistic children (Lesinskienė et al. 2002a). These above-mentioned studies revealed that medical personnel in Baltic countries require more teaching on autism and its characteristics as also attention to alternative ways of delivering treatment for these children.

Parenting

We found that there is interest in research on parent's mental health based on levels of stress, depression and anxiety. Results highlighted that parents of children with autism experienced statistically higher levels of stress, depression and anxiety compared with control groups (Matonytė 2005; Mickevičienė et al. 2009; Demčenko 2010; Stina 2013; Marii-Heleen 2014). In cross-sectional studies that compared parents of children with autism with parents of typically developing children, stress or depression were more common in those with autistic children and this correlated

Table 4 Results of articles

Reference first author and date	Country	Research method	Publication type	Tools used	Number of participants	Main findings
Lesinskienė (2000)	Lithuania	Epidemiological	Doctoral thesis part 1	Childhood Autism Rating Scale (CARS)	133 children with autism spectrum disorder (ASD)	The epidemiological studies revealed that in 1999, Vilnius district the prevalence of autism was 11.8:10,000 (0.12%). Out of 97 children, 38 were diagnosed with moderate autism and 59 severe autism. The study was performed in regular schools and kindergarten.
Lesinskienė (2000)	Lithuania	Cross-sectional	Doctoral thesis part 2	Questionnaire developed by authors	39 grandparents of children with ASD	Grandmothers perceived their grandchild in more positive caring manner than grandfathers. Grandparents perceived that their grandchildren would be better in special boarding schools.
Lesinskienė (2002)	Lithuania	Cross-sectional	Journal article	Free drawings	26 children with Asperger's syndrome (AS)	All children showed good abilities in drawing. Pictures had some common traits and were distinctly original, reflecting peculiarities of the syndrome features.
Lesinskienė (2002a)	Lithuania	Cross-sectional	Journal article	Questionnaire developed by the authors	75 mothers of children with ASD $N = 25$ and typically developing (TD) $N = 50$	Low appetite, narrow range of assortment of preferable dishes and digestive autonomic nervous system reactions were significantly more common in the ASD group. Sleep of the ASD children was significantly more often disrupted by waking up. Height and weight of the ASD children were delayed and not harmonious.
Lesinskienė (2002b)	Lithuania	Cross-sectional	Journal article	Questionnaire developed by the authors	111 mothers of children with ASD $N = 37$ and TD $N = 74$	Adaptation difficulties in medical services were very prominent, especially at the in-patient departments (unpredictable and impulsive behaviour, anxiety, decrease of appetite, sleep disturbances). Possibilities of home visit of the nurses are underestimated and could provide more useful and constructive help to the families.
Matonytė (2005)	Lithuania	Cross-sectional	Master thesis	Parental Stress Index (PSI)	220 mothers of children chronic allergies (CAs) $N = 84$, developmental delays (DDs) $N = 41$ and TD $N = 108$	The results showed that maternal stress is higher of mothers whose children are with developmental disabilities than mothers who are raising typically developing children and those suffering from chronic allergic diseases.
Ivoškuvienė and Urbutytė (2008)	Lithuania	Cross-sectional	Journal article	CARS adapted by the researcher	34 parents of children with ASD	Parents generally know behaviour features and communication ways of their children with ASD. Also, mothers in the process of upbringing usually use the ways of praise and encouragement, and fathers are more often inclined to punish the child.
Astrauskienė (2008)	Lithuania	Cross-sectional	Master thesis	Questionnaire designed by Lesinskiene	90 parents of children with ASD $N = 42$ and TD $N = 48$	Children with ASD had lower verbal and social skills as also poorer communication and behavioural capacities compared with typically developing.
Keverė et al. (2009)	Latvia	Cross-sectional	Journal article	Measurement of hyperhomocysteinaemia (Hcy)	91 children with schizophrenia $N = 37$ and with ASD $N = 54$	Correlation amongst diagnosis, severity of disease and level of Hcy was $r = -0.401$ ($p < 0.01$). It was found that the level of Hcy was the highest in 14 schizophrenic patients with acute condition and adverse course of disease.
Priede (2009)	Latvia	Mixed methods	Bachelor thesis	Observation in group work; questionnaire group work and interview	17 participants: children with ASD $N = 8$, parents of children with ASD $N = 8$, portage specialist $N = 1$	Social skills improve in case children with ASD attend group work lessons regularly and for a long period of time.
Ivonytė et al. (2009)	Lithuania	Cross-sectional	Journal article	Self-independence Scheme (SS) by Ivoškuvienė and Balčiūnaitė	28 children with ASD	The results of the research demonstrated that occupational therapy influenced the development of their self-independence skills. The intervention group's common self-independence skill's average was 73.5, whilst control group children's score was 65.9.
Mickevičienė et al. (2009)	Lithuania	Cross-sectional	Journal article	Cung's Depression Scale (CDS)	240 parents of children with ASD $N = 120$ and TD $N = 120$	The result showed that depression in mothers and fathers with autistic children did not differ. Both parents of autistic children had a higher

Table 4 (continued)

Reference first author and date	Country	Research method	Publication type	Tools used	Number of participants	Main findings
Karen (2015)	Estonia	Cross-sectional	Master thesis	Psycho-Educational Profile-3 (PEP-3)	172 children with intellectual disability (ID) $N = 32$, with ASD $N = 17$ and TD $N = 132$	depression than both parents of normally developing children ($p = 0.001$). There was a statistically significant difference amongst the typically developed children and special needs children in the test results. Children with intellectual disability scored the lowest in the domain of the use of speech whilst children with ASD on the behaviour rating scale. The results showed that PEP-3 test developmental subtests results were similar to the maladaptive behaviour subtests results. Positively and strongly were connected all the PEP-3 test composites with caregiver report subtests included behaviour. Mothers whose children have ASD displayed higher indicators in both levels of stress and feeling of guilt compared with mothers of typically developing children.
Kobolt (2010)	Estonia	Case study	Master thesis	Psycho-Educational Profile revised (PEP-R) and interview	10 children with PDD	
Demčenko (2010)	Latvia	Cross-sectional	Bachelor thesis	Parental Stress Inventory and Maternal Guilt Questionnaire	70 mothers of children with ASD $N = 35$ and TD $N = 35$	
Ustilaitė and Cvetkova (2011a)	Lithuania	Qualitative	Journal article	Semi-structured interviews	11 parents of children with cerebral palsy (CP) $N = 1$, ASD $N = 3$, Down syndrome (DS) $N = 6$, ID = 1	Positive experiences of parents raising disabled children: (1) feelings—emotional bond, (2) inner parent's growth—changed perception of life, (3) family relationship—common goals in family and (4) spiritual resources—less worry about material wealth.
Ustilaitė and Cvetkova (2011b)	Lithuania	Qualitative	Journal article	Semi-structured interviews	11 parents	Child disability suppresses the change of parental expectations that creates fear about the future in the family, problems of reconciliation with the fact of a disability; however, certain families are mobilised by such a situation.
Vaičekauskaitė and Aciénė (2011) Tuptis (2012)	Lithuania Estonia	Systematic review Quasi-experimental	Journal article Bachelor thesis	Meta-analysis Treatment and Education of Autistic and Communication-related handicapped Children (TEACCH)	N/A 23 participants: children with ASD $N = 12$, parents of children with ASD $N = 8$ and teachers $N = 3$	Complementary and alternative medicine has a huge potential to help for families of children with disabilities. Results showed that no statistically important differences were found in the results of dictating and reading exercises between ASD and controls groups. However, students' behaviour improved; they became more independent and motivated.
Medvedeva (2012)	Latvia	Quasi-experimental	Master thesis	Language Development Inventory (LDI) and Motor Imitation Scale (MIS)	17 children with ASD	The results of this study suggest that body imitation skills as well as imitation with objects correlate with expressive language in children with autism.
Dekšeniece (2012)	Latvia	Case study	Bachelor thesis	Pictograms	3 boys with ASD	Pictograms help children with autism perceive the contents of ethical teaching and communicate with surrounding people.
Tamošūnienė et al. (2012)	Lithuania	Case-control study	Journal article	Paediatric Evaluation of Disability Inventory (PEDI) and questionnaire developed for this study	66 children with ASD $N = 33$ and TD $N = 33$	Comparison with control group showed that 91% ($N = 30$) children with ASD developed self-help skills later than their peers ($p < 0.05$). Most prominent delay was determined in the areas of toilet skills and personal hygiene skills.
Žaromskytė (2012)	Lithuania	Qualitative	Master thesis	Interviews		

Table 4 (continued)

Reference first author and date	Country	Research method	Publication type	Tools used	Number of participants	Main findings
Pociūtė (2012)	Lithuania	Cross-sectional	Master thesis	Online questionnaire	76 participants (parents of children with ASD $N = 7$, professionals $N = 7$, education specialists $N = 60$, children with ASD $N = 2$)	According to the parents, socialisation of their children is limited by the frequent anger attacks. The parents emphasise that in the course of raising ASD child, they need help from relatives and family members. The educational specialists considered that parents had to be interested in new educational trends. Both specialists and parents sought for collaboration implementing the educational goal sets.
Jegorova-Marcenkiene et al. (2012)	Lithuania	Cross-sectional	Journal article	Edinburgh Postnatal Depression Scale (EPDS)	204 participants (speech therapists $N = 107$, parents $N = 42$, teachers $N = 19$, paediatricians $N = 5$, psychologists $N = 13$ and other professionals $N = 18$)	Paediatrician has a lack of knowledge about autism and the methods of education for children with ASD, but they are the first to notice autistic traits. The majority of teachers write individual programs for children with ASD, but generally, they work at the same time with whole class. Parents and teachers want that children with ASD have individual education.
Stina (2013)	Estonia	Intervention	Bachelor thesis	Physiotherapy	104 mothers of children (with DD $N = 14$, with pervasive developmental disorder (PDD) $N = 12$, with language disorder (LD) $N = 5$ and with motor developmental disorder (MDD) $N = 2$)	Out of 104 mothers, 33 (31.7%) had increased risk of depression. Statistically, these mothers were more likely to blame themselves when the affairs were turning bad and they had the idea of self-harming more often than the mothers who did not have signs of depression ($p < 0.05$).
Terje (2013)	Estonia	Case study	Master thesis	Interviews, PEP-R and Individual Developmental Plan (IDP)	14 boys with ASD 1 boy with ASD	Physical activity improved the physical conditions and reduce maladaptive behaviours in children with ASD. IDP team reached the following conclusions: it is necessary to structure the group room according to different activities and it is wise to visualise the daily schedule with the help of pictograms.
Loonun and Veldemann (2013)	Estonia	Cross-sectional	Bachelor thesis	Six open questions	41 parents of children with ASD	Of the parents, 61% had used one or more dietary intervention in the treatment of their autistic child. The most popular dietary intervention was the gluten-free and casein-free diet.
Bauze et al. (2013)	Latvia	Cross-sectional	Journal article	Anthropometric parameters	169 patients with ASD	According to anthropometric parameters, patients with ASD were found to be taller in height ($p < 0.001$); however, no significant differences in weight and head circumference were observed. Seizures were significantly more frequent in patients with severe mental retardation ($p = 0.003$).
Pentjuss et al. (2013)	Latvia	Cross-sectional	Journal article	Genetic analysis	235 mitochondrial cells from humans	It is found that deletion of SUCLG2 gene reduces the maximal production of ATP by 50% with wide flux variability range for most of reactions.
Vaičekauskaitė et al. (2014)	Lithuania	Intervention	Journal article	Sense and Self-Regulation Checklist (SSC), Parental Stress Index (PSI) and Bunsen Developmental Checklist (BDC)	8 children with ASD	The Qigong massage statistically significantly improved speaking, sleeping, attention concentration and communication for children with ASD and reduced aggression and tantrums.
Oie (2014)	Estonia	Literature review	Bachelor thesis	Nutrition tests	N/A	

Table 4 (continued)

Reference first author and date	Country	Research method	Publication type	Tools used	Number of participants	Main findings
Mari-Heleen (2014)	Estonia	Cross-sectional	Master thesis	Coping Inventory (COPE), Beck Depression Inventory (BDI) and Personality Inventory (NEO)	156 mothers of children (with ASD $N = 31$, with DiA $N = 41$, with AsT $N = 36$ and TD $N = 48$)	This study reflected that nutritional problems in autism differ from those resulting from dietary deficiencies. Suggestions for parents are to use less glutamine products and regulate exercise activity for their children with autism. Results showed that mothers of chronically ill children had much higher BDI score ($M = 12.96$, $SD = 10.03$) than mothers of healthy children ($M = 7.59$, $SD = 6.57$). All five personality factors had significant and meaningful correlation with coping strategies.
Bauze et al. (2014)	Latvia	Cross-sectional	Doctoral thesis	Genetic analysis	169 patients with ASD	A statistically significant correlation was found between autism spectrum disorders and the SNP rs11212733 ($p = 0.008$), which was localised in the 11q22.3 locus between DDX10 and EXPH5 genes.
Sarmite (2014)	Latvia	Qualitative	Bachelor thesis	Interviews	4 professionals	The role of the multidisciplinary team and the basic principles of therapy work with ASD children found to be important in educating children with ASD.
Kreivienė and Vaitėkauskaitė (2014)	Lithuania	Qualitative	Journal article	Structured interviews	10 mothers of children with CP $N = 2$, AS $N = 2$, DS $N = 2$, ASD $N = 2$ and ID $N = 2$ 1 boy with ASD	Dolphin-Assisted Therapy sessions helped family to face and identify their needs more precisely; moreover, families felt empowered and motivated.
Adomaitienė and Jurevičiūtė (2014)	Lithuania	Case study	Journal article	IDP		Composed suitable educational content, which corresponds to child faculties and potential capacities, influences developmental changes even for children with severe complex disabilities.
Serapinaitė (2014)	Lithuania	Mixed methods	Master thesis	Interviews and questionnaires developed by authors	87 participants (teachers $N = 37$, parents of children with ASD $N = 23$, children with ASD $N = 23$)	Children with ASD experience difficulty at school, they preferred to be alone and had substantial difficulty in expressing themselves. Parents stated that their biggest challenges are tantrums and behavioural problems, as also the unsupportive environment for such children, like uneducated society about autism itself.
Jurkšas and Pūkelis (2014)	Lithuania	Qualitative	Journal article	Semi-structured interviews	6 mothers of children with (Down syndrome (DS) $N = 5$ and ASD $N = 1$)	Key points that positively influenced mother's perception on their children: acceptance of help, efforts of parents or caregiver, the gift and efforts of a child with disabilities and fruits of nurturing a person with disabilities.
Labanauskaitė et al. (2014)	Lithuania	Cross-sectional	Journal article	Berg Balance Scale (BBS) and Dynamometry, Squat and Sit-up Test	10 children with ASD	Balance, muscle strength and endurance of children with ASD were significantly lower than those in healthy children. Physical therapy significantly improved physical capacity of ASD children, but the level of healthy children was not reached.
Elis (2015)	Estonia	Case study	Bachelor thesis	Mathematical calculation methods	1 boy with ASD	Pre-test and post-test results showed that using the 'number row', the student was able to perform calculations right 100% correct, and without the number row, only 17%.
Zvingule (2015)	Latvia	Cross-sectional	Master thesis	Adult Autism Spectrum Quotient (AASQ), Achenbach Adult Self Report (AAS) and Resilience	211 participants (ASD adults $N = 110$ and TD adults $N = 101$)	Results indicate that ASD correlates significantly with resilience, anxiety and depression. There is significant difference between resilience, anxiety and depression for unemployed with ASD compared with healthy, unemployed adults. Unemployed with ASD had higher depression and anxiety with low resilience.

Table 4 (continued)

Reference first author and date	Country	Research method	Publication type	Tools used	Number of participants	Main findings
Vilkienė and Kondrotienė (2015)	Lithuania	Case study	Journal article	Scale for Adults (RSA) Music therapy	2 children with ASD (1 boy and 1 girl)	Music activities revealed interpersonal relation between young autistic adolescent and pedagogue through more active eye contact; young autistic adolescents started to more actively communicate with gestures and body language.
Usitaitė et al. (2015)	Lithuania	Qualitative	Journal article	Interviews	12 parents of children with (CP $N = 1$, ASD $N = 1$, DS $N = 6$, ID $N = 2$)	Family counselling, the communication and cooperation of the family with various specialists and other families having similar experience is a prerequisite guaranteeing a better quality of life for children with disability and their parents.
Baškienė (2015)	Lithuania	Mixed methods	Master thesis	Interviews and questionnaires developed by authors	77 participants (parents of children with ASD $N = 7$ and social workers $N = 70$)	The most appropriate place to provide social services for a family having a child with ASD is a child day care centre. The main roles played by the social workers are informant, consultant and educator. The most important aspects of organised activities are social interaction and the development of social skills through the playing.
Lelde (2016)	Latvia	Literature review	Bachelor thesis	Pedagogical methods for socialisation	N/A	The process of socialisation of children with ASD aged 7–10 years can be successful if on the first hand the children are going to be observed continuously in order to choose the most appropriate methods what can improve socialisation abilities of children.

AASQ Adult Autism Spectrum Quotient, *AAS* Achenbach Adult Self Report, *BBS* Berg Balance Scale, *BDC* Bunse Developmental Checklist, *BDI* Beck Depression Inventory, *CARS* Childhood Autism Rating Scale, *CDS* Cung's Depression Scale, *COPE* Coping Inventory, *DAT* Dolphin-Assisted Therapy, *EPDS* Edinburgh Postnatal Depression Scale, *IDP* Individual Development Plan, *LDI* Language Development Inventory, *MIS* Motor Imitation Scale, *MGQ* Maternal Guilt Questionnaire, *NEO* Personality Inventory, *PEP-R* Psycho-Educational Profile revised, *PEP3* Psycho-Educational Profile third edition, *PEDI* Paediatric Evaluation of Disability Inventory, *PSI* Parental Stress Index, *PSIn* Parenting Stress Inventory, *RSA* Resilience Scale for Adults, *SSC* Sense and Self-Regulation Checklist, *SS* Self-independence Scheme, *TEACCH* Treatment and Education of Autistic and Communication-related handicapped Children, *AS* Asperger's syndrome, *ASD* autism spectrum disorder, *AsT* asthma, *CAs* chronic allergies, *CP* cerebral palsy, *DiA* diabetes, *DD* developmental disorder, *DS* Down syndrome, *Hcy* hyperhomocysteinemia, *ID* intellectual disability, *LD* language disorder, *PDD* pervasive developmental disorder, *MDD* motor development disorder, *SCZD* schizophrenia, *TD* typically developing

with child's behavioural difficulties. These findings are supported by previous research findings (Sharpley et al. 1997; Hamlyn-Wright et al. 2007).

Another area highlighted in review findings was parenting qualities and skills whilst raising child with autism (Ivoškuvienė and Urbutytė 2008; Ustilaitė and Cvetkova 2011a, b; Žaromskytė 2012; Pociūtė 2012; Serapinaitė 2014; Jurkštas and Pūkelis 2014; Ustilaitė et al. 2015). Study by Ivoškuvienė and Urbutytė (2008) stated that mothers use positive affirmation, whilst fathers use punishment and criticism in parenting their child. Research by Lesinskienė (2002) evaluated grandparent's perception of their autistic grandchild and revealed that grandmothers are more positive towards their grandchild than grandfathers. In addition, researches showed that parent's experience difficulty in raising child with autism and require higher levels of support from society (Ustilaitė and Cvetkova 2011a, b; Žaromskytė 2012; Serapinaitė 2014; Jurkštas and Pūkelis 2014) and professionals (Pociūtė 2012; Ustilaitė et al. 2015; Baškiene 2015). Despite difficulties in parenting child with autism, there were two studies that concentrated on positive aspects of raising children with autism (Ustilaitė and Cvetkova 2011a, b; Labanauskaitė et al. 2014).

These findings require further research on possible external factors of stress, depression or anxiety amongst parents of autistic children as causation is yet to be determined. There is lack of studies on coping or protective mechanisms that could be useful in addressing high levels of stress, anxiety or depression in parents of autistic children.

Autistic Adults

There was only one study of adults with autism (Zvingule 2015), which attempted to define mental health and resilience factors in autistic adult's population. Results indicated that unemployed autistic adults were more anxious and depressed compared to unemployed healthy controls. Also, autistic adults had lower levels of resilience compared with controls. This, scoping review showed that there is a large gap of research about education, work, relationships, personal development or support for autistic adults.

Treatments and Interventions

We found studies on various alternative therapies and interventions used across three countries such as art (drawing) (Lesinskienė 2002), homoeopathic medicine (Vaičekauskaitė et al. 2014), body imitation (Medvedeva 2012), qigong massage (Vaičekauskaitė and Acienė 2013), dolphin therapy (Kreiviniene and Vaičekauskaitė 2014), occupational health (Elis 2015) and music therapy (Ustilaitė

et al. 2015). Results of most therapies showed a statistical significant change in child's behaviour, physical health, self-independence and social skills. It is important to state that homoeopathic medicine was mainly researched for the 'cure' of autism symptoms. This could be explained by the perception of the society that still counts autism as illness that could be 'cured', and alternative medicine is seen as more acceptable than traditional medicine (Mikulėnaitė and Ulevičiūtė 2004).

Interventions used in these Baltic countries were TEACCH (Tupits 2012), pictograms (Dekšeniec 2012) and physiotherapy (Ivonytė et al. 2009; Stina 2013). Study results showed that there was no significant difference between intervention group and control in reading and dictating when using TEACCH. Whilst study that used pictograms found improvement in communication of children with autism, physiotherapy resulted in advanced self-independence skills amongst autistic children. Findings about the TEACCH program in the review do not support wider findings on this intervention, which are significant improvement in autistic child's communication and social behaviours (Panerai et al. 2002; Virues-Ortega et al. 2013). It is important to highlight that there is no data on usage of medical treatments that are available in Baltic States.

Strengthens and Limitations

This scoping review is a first analysis of the situation of autism in Baltic countries. This paper revealed the deficiencies in the research areas and lack of services around autism in Lithuania, Latvia and Estonia. The limitations of this review are the limited access to the papers that are published and the language barrier as some papers were published in the language that authors do not speak: Estonian and Latvian.

Implications

Review revealed that autism is severely under-researched area in Baltic region. In addition, the epidemiology of the disorder is unknown for Latvia and Estonia. The social aspects of autism, education experience and parenting, are the most intensively researched areas across three countries, whilst medical aspects, treatments, interventions, and services, are severely behind of current research in the world. For the future research, it is important to consider studying lives of adults with autism across Baltic States and also to engage in research on genetic and biological markers of autism and promote randomised control trials on available medical treatments. Finally, the researchers should aim to assess existing interventions and treatment plans in more integrated and universal manner.

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of conflict.

Ethical Approval This article does not contain any studies with human participants or animals performed by any of the authors.

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