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

Ruta Buivydaite1 · Charles R. Newton1 · Audrone Prasauskiene2

Received: 24 February 2017 / Accepted: 5 August 2017 / Published online: 5 September 2017
© The Author(s) 2017. This article is an open access publication

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 The prevalence of autism is unclear as only one outdated epidemiological study was found.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 (Lesinskiienė 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 (Lesinskiienė 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; Pūras et al. 2004).

---

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. Prauskušiė 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
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 1  Country databases used in this review

| Country | Library name | URL |
|---------|--------------|-----|
| Lithuania | Lituanistika | http://www.lvb.lt/primo_library/libweb/action/search.do |
| | Libis (National Bibliographic data bank) | http://nbdb.libis.lt/ |
| | Vilnius University | http://www.mnh.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.nlbe.ee/en |
| | University of Tartu Library | https://utlib.ut.ee/ |

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 (Lesinskiene 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; Tamšūnienė 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),
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; Prieđe 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 (Dekšeniece 2012; Medvedeva 2012; Pociūtė 2012; Tamošiūnienė et al. 2012; Terje 2013; Adomaičienė and Jurevičiūtė 2014; Sarmitė 2014; Vilkeliienė 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 (Kevere 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
congenital condition with an abnormally high level of homocysteine in the blood. The homocysteine is responsible for the vitamin B$_6$, B$_9$, and B$_{12}$ 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 3 Demographics of the records

| Characteristics                             | Lithuania | Latvia | Estonia |
|---------------------------------------------|-----------|--------|---------|
| Publication year (n)                        |           |        |         |
| 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 (n)                         |           |        |         |
| Journal article                              | 17        | 3      | 0       |
| Bachelor thesis                              | 0         | 5      | 5       |
| Master thesis                                | 6         | 2      | 4       |
| Doctoral thesis                              | 3         | 1      | 0       |
| Research type (n)                            |           |        |         |
| 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 (n)                |           |        |         |
| 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       |
| Reference first author and date | Country | Research method | Publication type | Tools used | Number of participants | Main findings |
|--------------------------------|---------|-----------------|-----------------|------------|------------------------|---------------|
| Lesinskiené (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. Grandmothers perceived their grandchild in more positive caring manner than grandfathers. Grandparents perceived that their grandchildren would be better in special boarding schools. All children showed good abilities in drawing. Pictures had some common traits and were distinctly original, reflecting peculiarities of the syndrome features. 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. 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. 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. 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. Children with ASD had lower verbal and social skills as also poorer communication and behavioural capacities compared with typically developing. 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. Social skills improve in case children with ASD attend group work lessons regularly and for a long period of time. 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. The result showed that depression in mothers and fathers with autistic children did not differ. Both parents of autistic children had a higher... |
| 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. |
| Kobolt (2010)                   | Estonia | Case study      | Master thesis    | Psycho-Educational Profile revised (PEP-R) and interview | 10 children with PDD | The results showed that PEP-3 test developmental subscales results were similar to the maladaptive behaviour subscales results. Positively and strongly were connected all the PEP-3 test composites with caregiver report subscales included behaviour. |
| Demčenko (2010)                 | Latvia  | Cross-sectional | Bachelor thesis  | Parental Stress Inventory and Maternal Guilt Questionnaire Semi-structured interviews | 70 mothers of children with ASD N = 35 and TD N = 35 | Mothers whose children have ASD displayed higher indicators in both levels of stress and feeling of guilt compared with mothers of typically developing children. |
| 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 supposes 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. Complementary and alternative medicine has a huge potential to help for families of children with disabilities. |
| Vaičkauskaitė and Aciene (2011) | Lithuania | Systematic review | Journal article | Meta-analysis | N/A | 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. |
| Tupits (2012)                   | Estonia  | Quasi-experimen- | Bachelor thesis  | Treatment and Education of Autistic and Communication-related handicapped Children (TEACCH) | 23 participants: children with ASD N = 12, parents of children with ASD N = 8 and teachers N = 3 | The results of this study suggest that body imitation skills as well as imitation with objects correlate with expressive language in children with autism. |
| Medvedeva (2012)               | Latvia   | Quasi-experimen- | Master thesis    | Language Development Inventory (LDI) and Motor Imitation Scale (MIS) | 17 children with ASD | Pictograms help children with autism perceive the contents of ethical teaching and communicate with surrounding people. |
| Dekšeniece (2012)             | Latvia   | Case study      | Bachelor thesis  | Pictograms | 3 boys with ASD | 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. |
| Tamošiūnienė et al. (2012)     | Lithuania | Case-control study | Journal article  | Paediatric Evaluation of Disability Inventory (PEDI) and questionnaire developed for this study Interviews | 66 children with ASD N = 33 and TD N = 33 | |
| 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-Marčenkiene 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. 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 (\( p < 0.05 \)). |
| Stina (2013)                    | Estonia          | Intervention    | Bachelor thesis                   | Physiotherapy                                   | 14 boys 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.                                                                                                                                             |
| Terje (2013)                    | Estonia          | Case study      | Master thesis                     | Interviews, PEP-R and Individual Developmental Plan (IDP) | 1 boy 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. 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 (\( p = 0.003 \)). 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. |
| Loonum and Veldemann (2013)     | Estonia          | Cross-sectional | Bachelor thesis                   | Six open questions                              | 41 parents of children with ASD | The Qigong massage statistically significantly improved speaking, sleeping, attention concentration and communication for children with ASD and reduced aggression and tantrums.                                                                                                                                                              |
| Bauze et al. (2013)             | Latvia           | Cross-sectional | Journal article                   | Anthropometric parameters                      | 169 patients with ASD   |                                                                                                                                                                                                                                                                                                                                                                                                            |
| Pentjuss et al. (2013)          | Latvia           | Cross-sectional | Journal article                   | Genetic analysis                                | 235 mitochondrial cells from humans |                                                                                                                                                                                                                                                                                                                                                                                                            |
| Vaičėkauskaitė et al. (2014)    | Lithuania        | Intervention    | Journal article                   | Sense and Self-Regulation Checklist (SSC), Parental Stress Index (PSI) and Busse Developmental Checklist (BDC) | 8 children with ASD    |                                                                                                                                                                                                                                                                                                                                                                                                            |
| Oie (2014)                      | Estonia          | Literature review| Bachelor thesis                   | Nutrition tests                                  | N/A                    |                                                                                                                                                                                                                                                                                                                                                                                                            |
| Reference first author and date | Country       | Research method | Publication type | Tools used                                      | Number of participants | Main findings                                                                                       |
|--------------------------------|---------------|-----------------|------------------|------------------------------------------------|------------------------|----------------------------------------------------------------------------------------------------|
| Marii-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. |
| 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. |
| Kreivinienė and Vaičėkauskaitė (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 | 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                                             | 1 boy with ASD        | 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. 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. |
| Jurkštas and Pūkelis (2014)   | Lithuania     | Qualitative     | Journal article  | Semi-structured interviews                      | 6 mothers of children with (Down syndrome (DS) N = 5 and ASD N = 1) | 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. |
| Labanauskaitė et al. (2014)   | Lithuania     | Cross-sectional | Journal article  | Berg Balance Scale (BBS) and Dynamometry, Squat and Sit-up Test | 10 children 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%. 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. |
| Elis (2015)                    | Estonia       | Case study      | Bachelor thesis  | Mathematical calculation methods                 | 1 boy with ASD        |                                                                                                     |
| 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) |                                                                                                     |
| Reference first author and date | Country     | Research method | Publication type | Tools used | Number of participants | Main findings                                                                                                                                                                                                 |
|--------------------------------|-------------|-----------------|-----------------|------------|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Vilkelienė and Kondrotienė (2015) | Lithuania   | Case study      | Journal article | 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. |
| Ustilaitė 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. |
| Lele (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 Urbuty 2008; Ustilaite and Cvetkova 2011a, b; Žaromskytė 2012; Pociūtė 2012; Serapinaitė 2014; Jurkštas and Pūkelis 2014; Ustilaite et al. 2015). Study by Ivoškuvienė and Urbuty (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 (Ustilaite and Cvetkova 2011a, b; Žaromskytė 2012; Serapinaitė 2014; Jurkštas and Pūkelis 2014) and professionals (Pociūtė 2012; Ustilaite et al. 2015; Baškienė 2015). Despite difficulties in parenting child with autism, there were two studies that concentrated on positive aspects of raising children with autism (Ustilaite 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) (Lesinskiene 2002), homoeopathic medicine (Vaičėkauskaitė et al. 2014), body imitation (Medvedeva 2012), qigong massage (Vaičėkauskaitė and Aciënė 2013), dolphin therapy (Kreivinienė and Vaičėkauskaitė 2014), occupational health (Elis 2015) and music therapy (Ustilaite 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 (Dekšeniece 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.
Funding The study was not funded by any grants. This paper is part of doctoral dissertation about parental experiences in raising child with autism spectrum in Lithuania and UK, which is funded by the University of Oxford, Department of Psychiatry.

Compliance with Ethical Standards

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

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

Open Access This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made.

References

Adomaitienė, R. & Jurevičiūtė, K. (2014). I vaikų orientuoto specialiojo ikimokkyklinio ugdymo turinio modelis, [the child-centred preschool special education content model]. Didactics, 9(1), 115–118.

Astrauskiene, G. (2008). Sveikų ir turinčių autizmo sutrikimą socialinės sąveikos, verbalinės ir neverbalinės komunikacijos bei elgesio tyrimas/ [healthy children and children with autism spectrum—social aspects, verbal and nonverbal communication, and behavioural analysis] (masters of sports pedagogy and psychology). Kaunas: Lithuanian Physical Education Academy.

Baškienė, A. (2015). The formation of the possibilities of social provision for the families bringing up children with autism spectrum disorders. (master of special education). Siauliai: University of Siauliai.

Bauze, D., Kevere, L., Kronberga, Z., Rizevs, A., Dzalba, A., Daneberga, Z., et al. (2013). The clinical analysis of patients with autism and autism spectrum disorders in Latvia. Proceedings of the Latvian Academy of Sciences. Section B. Natural, Exact, and Applied Sciences, 67(6), 146–163.

Bauze, D., Piekuse, L., Kevere, L., Kronberga, Z., Rizevs, A., Vaivade, I., et al. (2014). Association of single nucleotide polymorphism in chromosome 11 with autism spectrum disorder. Proceedings of the Latvian Academy of Sciences. Section B. Natural, Exact, and Applied Sciences, 67(6), 6–10. doi: 10.2478/prolas-2013-0079.

Dekšieniece, Z. (2012). The use of a pictogram to the ethics training for children with learning disabilities. (bachelor of speech and language therapy). Riga: University of Latvia.

Demčenko, K. (2010). Children with autistic spectrum disorder maternal stress and guilt. (bachelor of psychology). Riga: University of Latvia.

Elis, R. (2015). Calculating the results of one of teaching methods—counting on the fingers ASD child’s example. (bachelor of special education). Tartu: University of Tartu.

Emond, A., Emmett, P., Steer, C., & Golding, J. (2010). Feeding symptoms, dietary patterns, and growth in young children with autism spectrum disorders. Paediatrics, 126(2), 337–342. doi:10.1542/peds.2009-2391.

Gao, H., Chi, J., Xing, Y., & Wang, P. (2009). Influence of folic acid on plasma homocysteine levels & arterial endothelial function in patients with unstable angina. The Indian Journal of Medical Research, 129(3), 279–282.

Hamlyn-Wright, S., Draghi-Lorenz, R., & Ellis, J. (2007). Locus of control fails to mediate between stress and anxiety and depression in parents of children with a developmental disorder. Autism, 11(6), 489–501. doi:10.1177/1362361307083258.

Ivonytė, R., Kavaliauskienė, G., & Salvy, J. (2009). Veiksniai, darančią įtaką vaikų, sergančių autizmu, savarankiškumo įgūdžių ugdymui, vertinimas [Evaluation of influence on independence and skills of children with autism] Health Sciences, 19(2), 121–132.

Ivokšvienienė, R. & Urbutytė, A. (2008). Autistiško vaiko pažinimas šeimoje [Recognition of an autistic child in the family]. Social Science Education, 4(20), 158–163.

Jegorova-Marcenkiene, N., Jasonaitė, A., Mikulienė, L., Lesinskienė, S., & Petružyte, J. (2012). Evaluation of emotional state of parents of developmentally disabled children. Health Sciences, 2(6), 4–15.

Jurkštas, S., & Pūkelis, K. (2014). Pozityvios įtakos veiksniai šeimos nariams, ugdantems proto negalių turinčius vaikus [positive influence on the family members, who are raising children with mental disability]. SOTER: Journal of Religious Science, 52, 113–126. doi: 10.7220/2335-8785.52(80).7.

Karen, K. (2015). The outcome of PEP-3 test for children with autism spectrum disorders and intellectual disability. (master of special education). Tartu: University of Tartu.

Kevere, L., Purvina, S., Bauze, D., Zeiberts, M., Rizevs, A., Purvins, I., Caune, M. & Andrezina, R. (2009). Psychiatric disorders in childhood and hyperhomocysteinaemia. European Psychiatry, 24(1), 96–101. doi: 10.1016/S0924-338X(09)71194-0.

Kobolt, K. (2010). PEP-3 TEST development and assessment for children 3–8 years with autism disorder. (master of special education). Tartu: University of Tartu.

Krausauskaitė, L. (2010). Analysis of the social help provided by family support centre for family's raising autistic child. (master of social work and its management). Vilnius: Vilnius University.

Kreivienienė, R. & Vaiciukaitė, R. (2014). Complementary and alternative medicine: regulation and needs of families of children with disabilities. Public Health, 19), 64–78.

Labanauskaitė, I., Lileikytė, A., Vasiliauskytė, A., Dudonienė, V., Urbanavičius, V., Čiaukšienė, S., & Juoknius, R. (2014). Impact of physiotherapy on physical capacity of 7–11-year-old children with autism disorder. Journal of Rehabilitation Science: Care, Physiotherapy and Ergo therapy, 2(11), 8–10.

Lede, A. (2016). The process of socializing 7–10 years old children with autism. (master of sociology). Riga: University of Latvia.

Lesinskienė, S. (2000). Vilnius miesto vaikų autizmus [Vilnius city children’s autism]. (doctoral in psychology), Vilnius University. Published in. Journal of Biological Psychiatry and Psychopharmacology, 2, 1–148.

Lesinskienė, S. (2002). Children with Asperger’s syndrome: specific aspects of their drawings. International Journal of Circumpolar Health, 2, 7–16.

Lesinskienė, S., Pūras, D., Kajokienė, A., & Senina, J. (2002a). Aspects of nursing of the autistic children. Medicina, 38(4), 412–419.

Lesinskienė, S., Vilūnaitė, E., & Packevičiūtė, B. (2002b). Aspects of the development of autistic children. Medicina, 38(4), 405–411.

Lesinskienė, S., Ranceva, N., Vitkute-Maigiene, L., Stacevic, I., & Mitrauskas, M. (2008). Dynamics of inpatient child psychiatric care in the time frame 1995–2005. International Journal of Psychiatry in Clinical Practice, 12(8), 247–255.

Loonum, K., & Veldemann, A. (2013). Parental reports on the efficacy of dietary intervention for their children with autism spectrum disorders. (bachelor of special education). Tartu: University of Tartu.

Mansell, W., & Morris, K. (2004). A survey of parents’ reactions to the diagnosis of an autistic spectrum disorder by a local service: access to information and use of services. Autism, 8(4), 387–407. doi: 10.1177/1362361304045213.

Marii-Heleen, A. (2014). Stress management factors in mothers, who are raising chronically sick children in Estonia. (master of psychology). Tartu: University of Tartu.
Matonytė, M. (2005). Mothers maternal stress features raising children with developmental problems or suffering from chronic allergic diseases. (master of psychology). Kaunas: University of Vytautas Magnus.

Medvedeva, O. (2012). Initiation skills related to expressive vocabulary of children with autism spectrum disorders at preschool age. (master of speech and language therapy). Riga: University of Latvia.

Mickeyvičienė, E., Šinkariova, L., & Perminas, A. (2009). Depression in fathers and mothers of children with autism spectrum disorder. Psychology, 39(1), 19–30.

Mikulėnaitė, L., & Ulevičiūtė, R. (2004). Early age child autism. Vilnius: Open Society Institute, Soros Foundations Network.

Miller, J. W., Nadeu, M. R., Smith, D., & Selhub, J. (1994). Vitamin B-6 deficiency vs folate deficiency: comparison of responses to methionine loading in rats. American Journal of Clinical Nutrition, 59(5), 1033–1039.

Oie, V. (2014). The essence of autism and treatment using physical therapy and nutritional interventions. (bachelor of psychology). Tartu: Tartu University.

Panerai, S., Ferrante, L., & Zingale, M. (2002). Benefits of the Treatment and Education of Autistic and Communication handicapped Children (TEACCH) programme as compared with a non-specific approach. Journal of Intellectual Disability Research, 46, 318–327. doi:10.1046/j.1365-2788.2002.00388.x

Pentjuss, A., Rubenis, O., Bauze, D., Aprupe, L., & Lace, B. (2013). Flux variability analysis approach of autism related metabolism in stoichiometric model of mitochondria. Bio-systems and Information technology, 2, 37–42. doi:10.11592/bi.131102.

Pociūtė, K. (2012). Children with autism spectrum disorder: individual education needs. (master of special education). Siauliai: University of Siauliai.

Priede, A. (2009). The role of group studies in promoting interaction of preschool children. (master of psychology). Riga: University of Latvia.

Pūras, D., Germanavičius, A., Povilaitis, R., Veniute, M., & Jasilionis, D. (2004). Lithuania mental health country profile. International Review of Psychiatry, 16(1–2), 117–125. doi:10.1080/09540260310001635168.

Querdenker, E. U., & Meirhofer, K. (2014). Report on international models and standards being focused on the process of vocational integration and the necessary trainings to improve the employability of people with autism spectrum disorder: cases of Estonia, Latvia and Lithuania, 114–122. Retrieved from European Union Lifelong Learning Program. Gruutving Projects Publisher: Berlin

Sarmite, B. (2014). Significance of multidisciplinary team, caring for children with autism spectrum disorders. (bachelor of speech and language therapy). Riga: University of Latvia.

Serapinaitė, A. (2014). Socialization aspect of adolescents with autism spectrum disorders. (master of special education). Siauliai: University of Siauliai.

Sharpley, C., Bitsika, V., & Efremidis, B. (1997). Influence of gender, parental health, and perceived expertise of assistance upon stress, anxiety, and depression among parents of children with autism. Journal of Intellectual and Developmental Disability, 22(1), 19–28.

Slay, B. (2009). Poverty inequality and social policy reform in the former Soviet Union. New York: United Nations Report

Stina, P. (2013). Asperger’s syndrome in childhood: the nature and physiotherapeutic aspects. (bachelor of special education). Tartu: University of Tartu.

Tamošiūnienė, J., Mikulėnaitė, L., Petrušyte, J., Raistenskis, J., & Jucevičius, A. (2012). Development of self-help skills of preschool children with autism spectrum disorders. Health Sciences, 22(6), 117–123.

Terje, K. (2013). Individual development plan implementation for 6-year old boy with autism teaching in kindergarten (master of special education). Tartu: University of Tartu.

Tupits, K. (2012). TEACCH principles impact of using the autism spectrum disorder pupil’s academic performance in Estonia. (bachelor of psychology). Tartu: University of Tartu.

Ustilaite, S., & Cvetkova, L. (2011a). Positive experience of families raising children with disability. Journal of Pedagogy, 8, 135–142.

Ustilaite, S., & Cvetkova, L. (2011b). Changes of inner and social life of the families that raise disabled children. Journal of Social Work, 10(1), 69–76.

Ustilaite, S., Kuginytė-Arlauskienė, I., Cvetkova, L., & Kalinkevičienė, A. (2015). Message on child’s disability and perspectives of development: parents’ experiences. Pedagogika, 117(1), 158–167. doi:10.15823/p.2015.075.

Vačkauskaite, R., & Acienė, E. (2011). Seinoms, auginamčios vaiku s negalia, sveikatos išteklių stiprinimas: ėigong masazo galimybes [Families raising children with disabilities, strengthening health resources: Chigong massage opportunities]. Health Science, 23(1), 74–78. doi:10.5200/sm-hs.2013.013.

Vačkauskaite, R., Kreiviniene, B., & Vilvikas, J. (2014). Preconditions and possibilities for integration of CAM and traditional medicine: situation of families of children with disabilities. Health Sciences, 24(4), 38–43. doi:10.5200/sm-hs.2014.066.

Vilkeliienė, A., & Kondrotienė, E. (2015). Music activity as a communication tool for young autistic adolescents. Pedagogika, 117(1), 185–197. doi:10.15823/p.2015.077.

Viruses-Ortega, J., Julio, F. M., & Pastor-Barriuso, R. (2013). The TEACCH program for children and adults with autism: a meta-analysis of intervention studies. Clinical Psychology Review, 33(8), 940–953. doi:10.1016/j.cpr.2013.07.005.

Whiteley, P., Haracopos, D., Knivsberg, A.-M., Reichelt, K. L., Parlar, S., Jacobsen, J., et al. (2010). The ScanBrit randomised, controlled, single-blind study of a gluten- and casein-free dietary intervention for children with autism spectrum disorders. Nutritional Neuroscience, 13(2), 87–100. doi:10.1179/147683010X1261460769322.

Žaromskytė, O. (2012). Cognition of autistic preschool children. (master of special education). Siauliai: University of Siauliai.

Zvingule, S. (2015). Symptom correlations of autism spectrum disorder with unemployment duration, resilience, anxiety and depression for unemployed. (master of psychology). Riga: University of Latvia.