



Pasaules  
latviešu  
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World  
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of Latvian  
Scientists

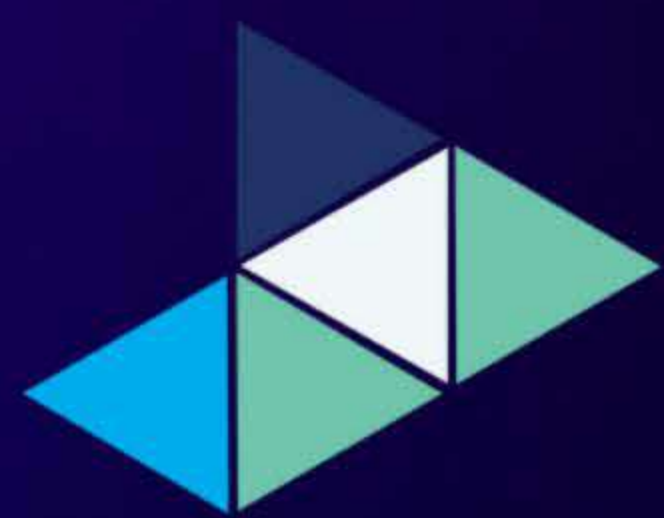
# STENDA REFERĀTI POSTER PRESENTATIONS



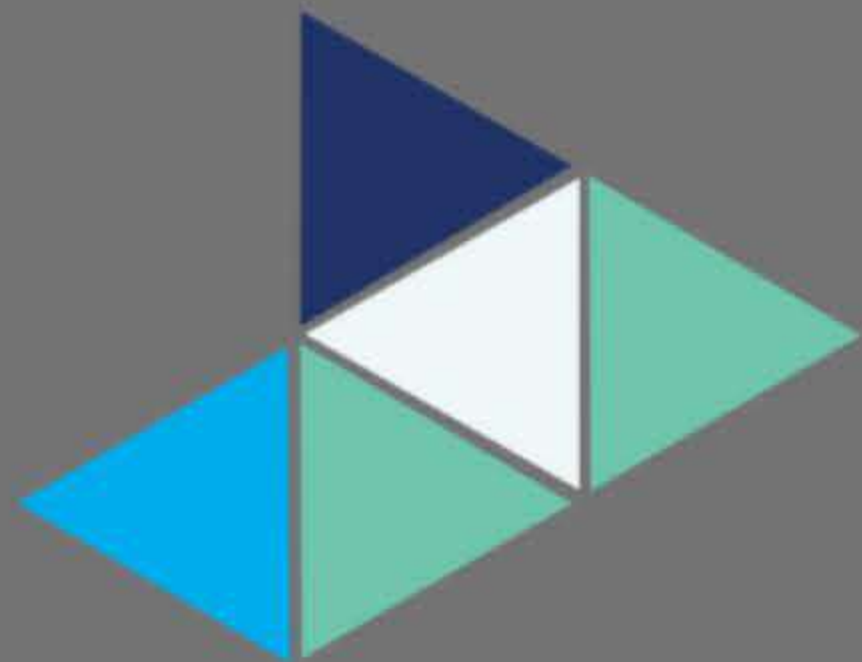
ZINĀTNES  
IETEKME



DIGITĀLĀ  
TRANSFORMĀCIJA



ZALĀ  
PĀRVEIDE



**CITA  
-  
TĚMA**

# Development of a Diagnostic Method for Oculomotor Dysfunction

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## Introduction

In reading, efficient eye movement performance is crucial for proper tracking of the text and comprehension of the material. The ability to make quick and accurate eye movements, such as saccades and fixations, is essential for fluent reading [1]. Children who struggle with oculomotor development may experience difficulties with reading and comprehension, which can impact their academic achievement [2]. In addition to reading, eye movements are also important in sports, particularly those that require tracking of moving objects such as baseball, tennis, or soccer. Accurate and efficient eye movements are necessary for tracking the ball or opponent, predicting their movements, and making quick decisions [3]. Eye movements also play a role in other activities such as driving, navigating through crowded environments, and even social interactions.

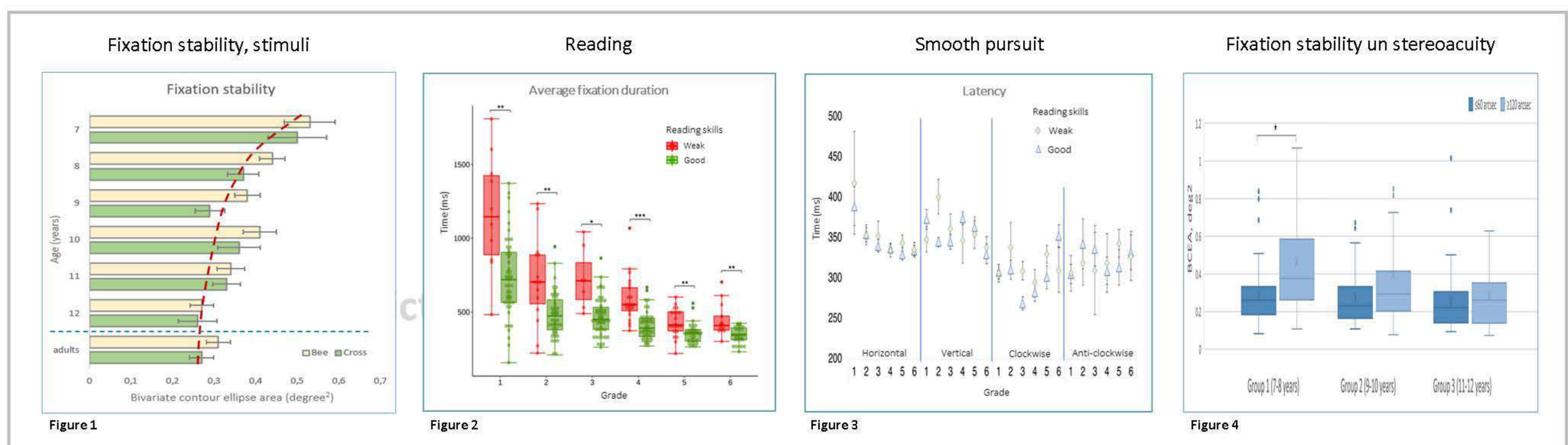


## Research Objective

There are several methods applied in clinical practice to assess oculomotor performance - (1) manual and subjective tests – NSUCO, Pierce, King-Dewick, and DEM tests; (2) eye-tracking technologies; and (3) Electrooculography (EOG) and functional magnetic resonance imaging (fMRI). However, each of these methods evaluates a specific stage of eye movement programming and is not always practical in clinical settings due to factors such as reliance on the practitioner's experience, high costs, and inconvenience. To address these limitations, our study drew upon the practical experience of optometrists who regularly conduct vision assessments and encounter eye movement-related problems. Specifically, we aimed to **develop an objective and quantitative approach for assessing eye movement performance** in both children and adults using eye-tracking technology.



## Results & Discussion



**Fig.1:** There was **no statistically significant difference in the type of stimulus fixation**. Fixation stability reaches adult value around 12 years of age. **Fig.2:** During reading, the **average fixation duration** was significantly **longer in children with reading disabilities** compared to children without them. **Fig.3:** There was **no difference in the latency** of initiating the smooth pursuit movement between children with reading difficulties and those without. **Fig.4:** The results demonstrated that **fixation stability** between children with reduced stereoacuity and normal stereoacuity **differed** significantly **only in the first group**, i.e., children with more unstable fixation also had reduced stereoacuity.



## Conclusions

- We are currently analysing the data and developing age norms for each eye movement parameter – saccades, smooth pursuit, fixation stability, average fixation duration, saccades jump and speed during reading
- We have developed a methodology and, after testing and analysing the data, we have understood what needs to be improved.
- One of the major strengths is the potential use of this method outside of specialist practice, such as in school environments
- Furthermore, we aim to collect more data to develop an AI model that can improve oculomotor dysfunction diagnosis



## References

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# The role of giant cancer cells in creating a “female pregnancy-like system” supporting cancer cell resistance

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## Introduction

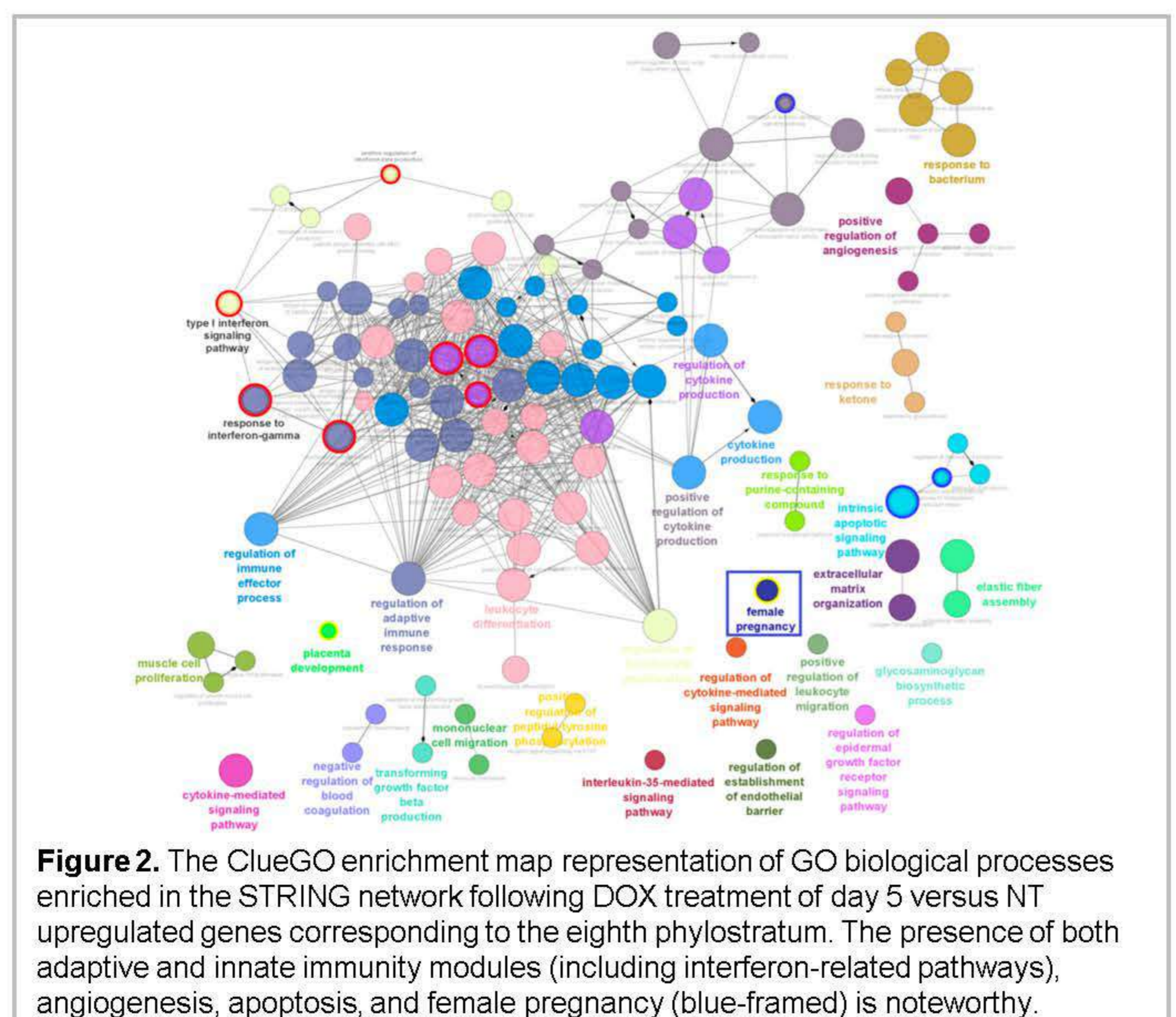
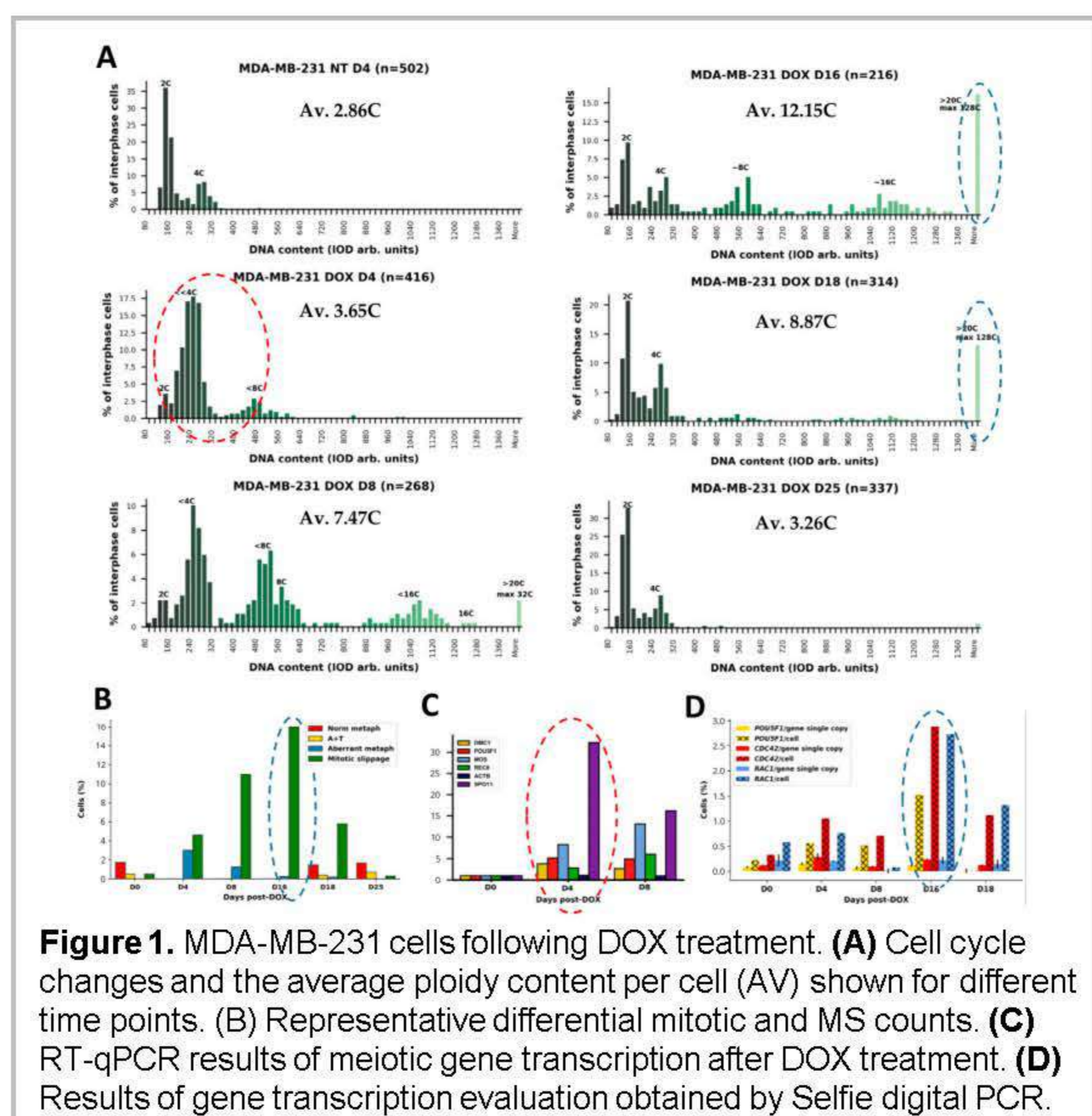
One of the resistance mechanisms of tumor cells to evade anti-cancer therapy is the formation of giant cells through the incomplete mitosis, called 'mitotic slippage' (MS).

## Research Objective

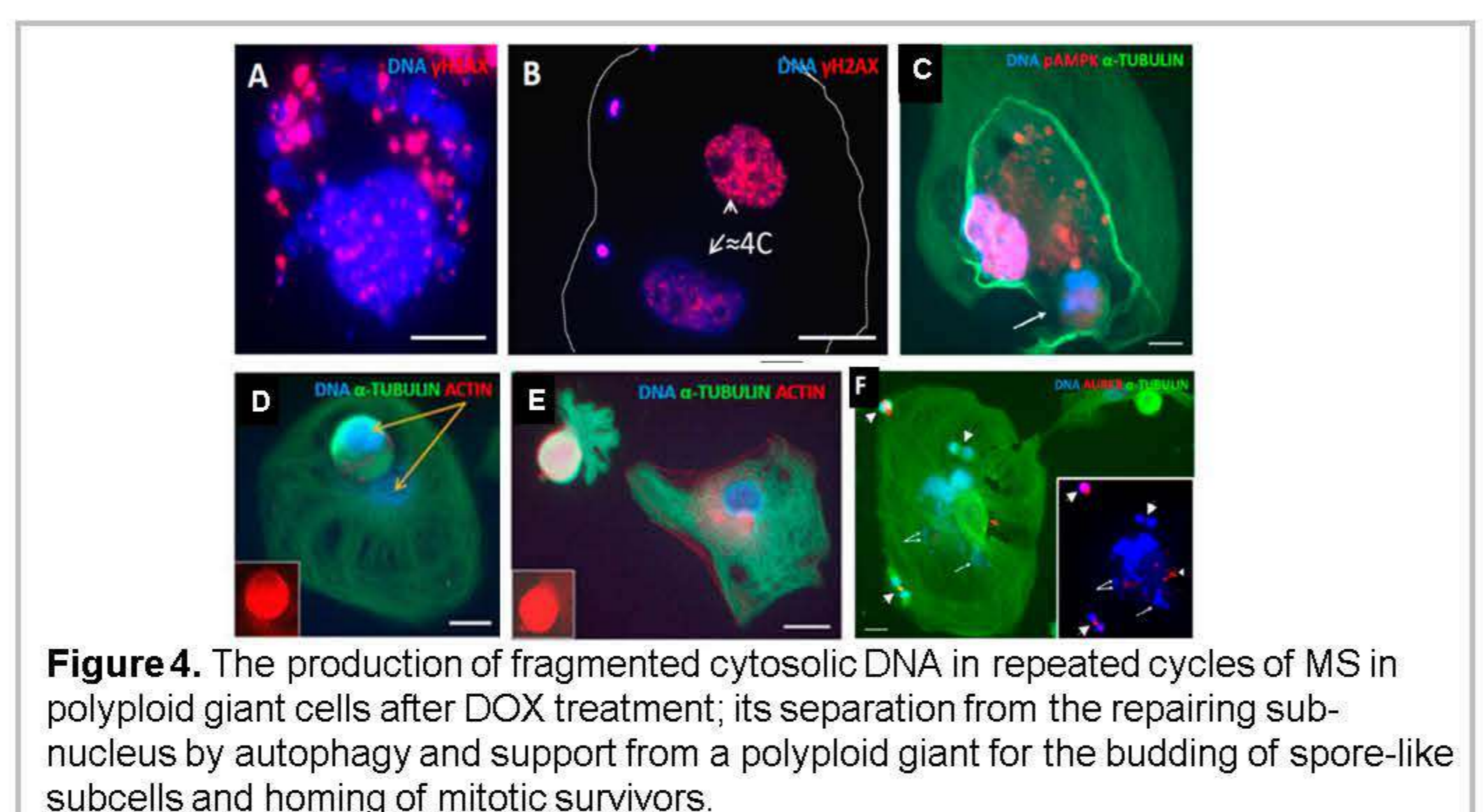
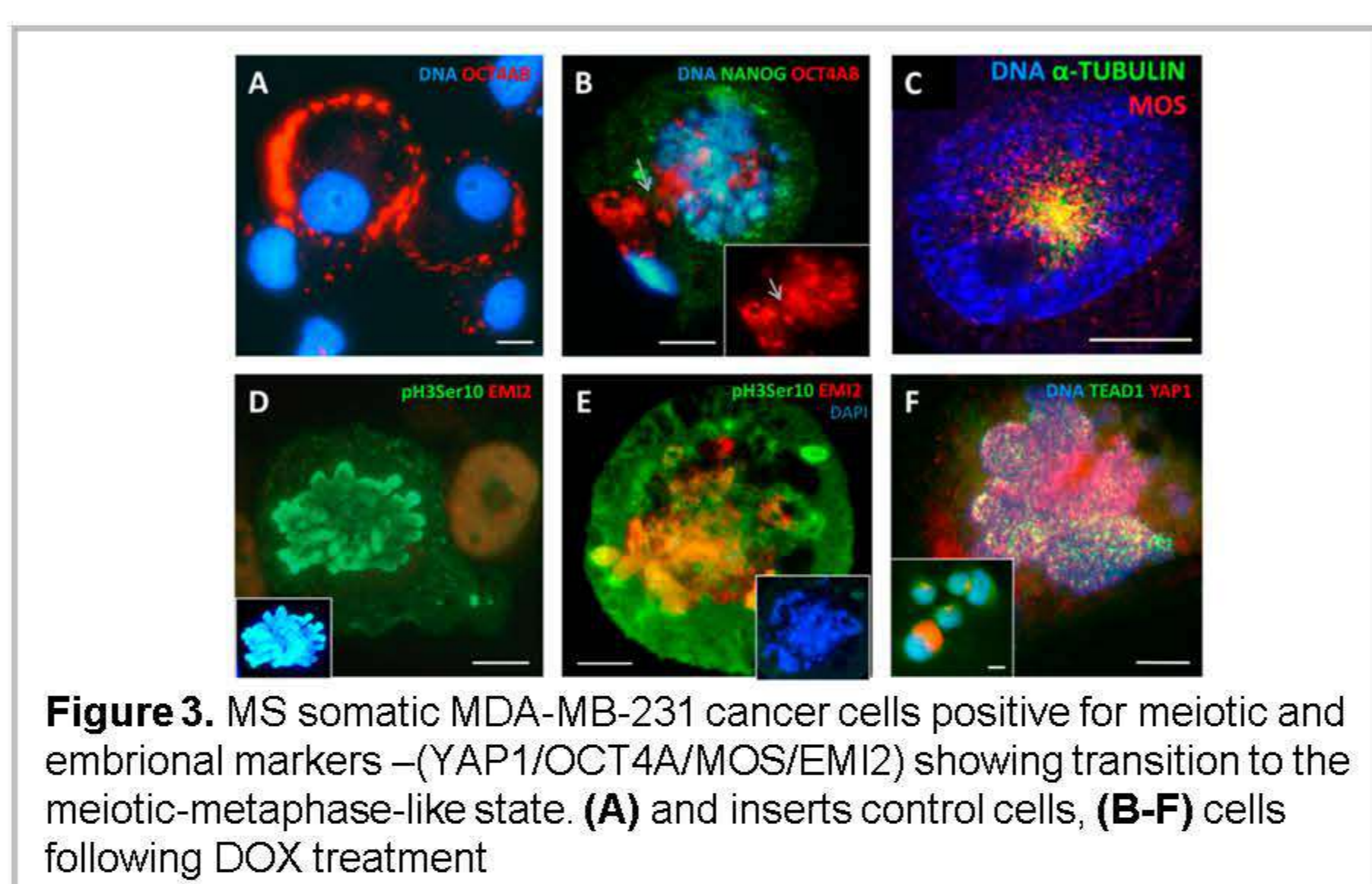
To study role of MS and giant cancer cells in the recovery process of metastatic triple-negative breast cancer MDA-MB-231 cell line after anticancer treatment.

## Results & Discussion

MDA-MB-231 cells were treated with anticancer drug doxorubicin for 24h and monitored until the appearance of resistant escape clones. Cells entered MS discarding damaged DNA in cytoplasm. We noted two populations of polyploid giant cells: those budding surviving offspring, versus those reaching huge ploidy by repeated MS and persisting for several weeks. MS somatic cancer cell showed transition to the meiotic-metaphase-like state (YAP1/OCT4A/MOS/EMI2-positivity).



Transcriptome analysis of giant cells showed upregulation of genes related to the inflammatory innate immune response to cytosolic DNA and the reproductive module of female pregnancy (upregulating placenta developmental genes). Asymmetry of the two subnuclei types, one repairing DNA and releasing budding subcells and the other persisting and degrading DNA in a polyploid giant cell, was revealed.



## Conclusions

We propose role of MS during the process that provides cancer cell resistance to genotoxic treatment through creating a "female pregnancy-like" system within a single polyploid giant cancer cell. Acquired knowledge might lead to the development of feasible cancer combination therapy in the future and enhance national scientific capacity.

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Ref. doi: [10.3390/ijms24043237](https://doi.org/10.3390/ijms24043237)

# Cornerstones of the Exploration of Early Written Latvian Sources: Corpus, Dictionary and Library

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Latvian Language Institute, UL; Institute of Mathematics and Computer Science, UL

## Introduction

In 2002, *SENIE*, the Corpus of early written Latvian ([senie.korpuss.lv](http://senie.korpuss.lv)) was launched. Since then, it has been constantly supplemented with various 16th–18th c. sources, widening its scope accordingly. In step with the technological development, text files in Unicode format were added to the website for the convenience of users; more than 70 texts are currently publicly available. In 2022, the Corpus was incorporated in the Latvian National Corpora Collection (LNCC), and queries in modern spelling was made possible in the *NoSketchEngine* system ([korpuss.lv/id/Senie](http://korpuss.lv/id/Senie)).

Currently, 3 resources have developed from the corpus:

- 1) the original version of the corpus as a digital library (under development);
- 2) the new version of the corpus *SENIE*;
- 3) the Historical dictionary of the Latvian language (LVVV).

## Historical dictionary of Latvian

Work on a corpus-based Historical dictionary of Latvian (16th–17th c.) is in progress ([tezaurs.lv/lvvv](http://tezaurs.lv/lvvv)); ca. 2000 entries are publicly available today. Each dictionary entry is based on a study of the history of the word, and users have the opportunity to find out when the word was first mentioned in Latvian texts, what its origin is, how its meaning has changed, etc. The dictionary offers elaborate search options. The dictionary is written in *TLex*; transfer of the current ASCII format entries to Unicode and integration with the new version of the corpus is a forthcoming task.

**LVVV**  
Latviešu valodas vēsturiskā vārdnīca (16.–17. gadsimts)

dzereši      **dzereši** (2) s. m. pl. dserreschi (2)

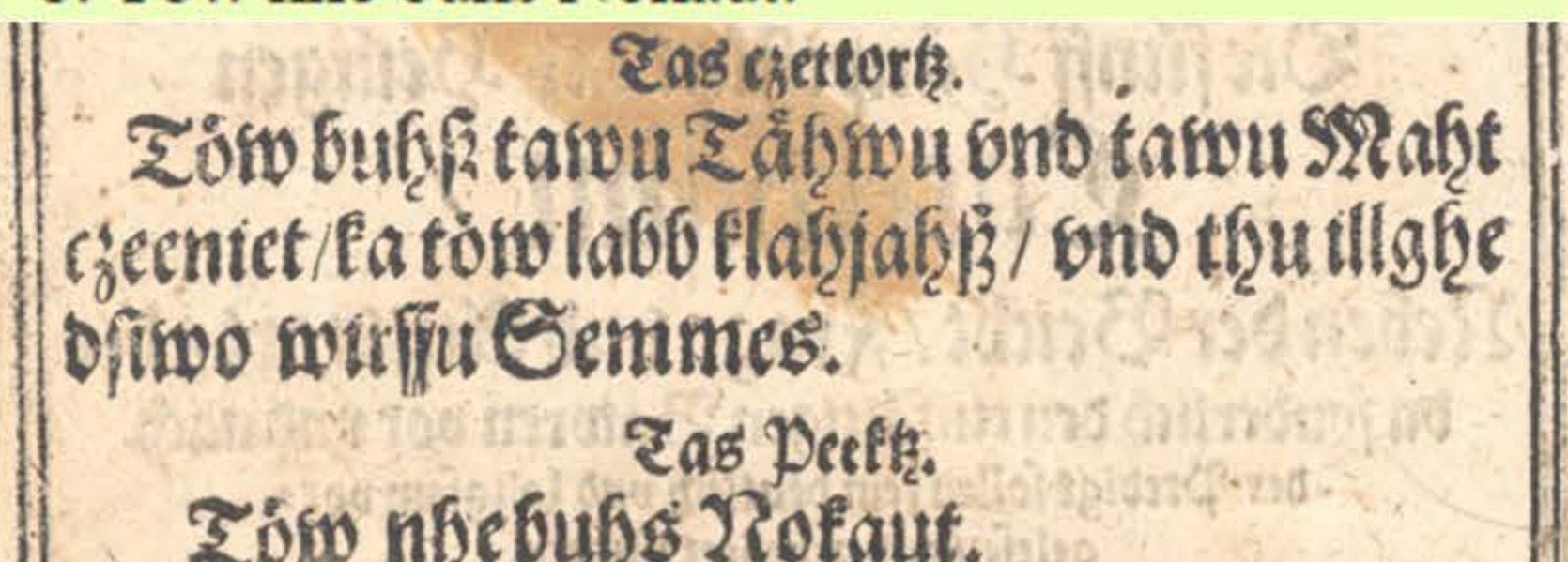
*Dserreschi*. bauren dünne bier. Fuer1650\_70\_1ms, 60<sup>21</sup>.  
*Dserreschi*. bauren dün bier. Fuer1650\_70\_2ms, 99<sup>13</sup>.  
piāns alus, ko gatavo no otrreizēja uzlējuma, piānalus  
*Dserreschi*. bauren dünne bier. Fuer1650\_70\_1ms, 60<sup>21</sup>.  
*Dserreschi*. bauren dün bier. Fuer1650\_70\_2ms, 99<sup>13</sup>.

◆ ↑ la. dzert  
[2020-04]

## The Corpus *SENIE*: original and new version

G. Manzel «Der kleine Katechismus» (1631, 448)

3: Tas czettortz.  
4: Tōw buhß tawu Tāhwu vnd tawu Maht  
5: czeeniet / ka tōw labb klahjahß / vnd thu illghe  
6: dšiwō wirşſu Semmes.  
7: Tas Peektz.  
8: Tōw nhe buhs Nokaut.



CONCORDANCE      SENIE: 16.-18.gs. teksti

simple dziesm\* 735 (270.19 per million)

Details     Left context    KWIC     Right context

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51	<input type="checkbox"/>	doc#17   le patteitczybams / vnd garrigims myligims	<b>czefmims</b>	/ vnde czedath tham Kungam exkan yuufin

With the transfer of corpus data to the *NoSketchEngine* corpus platform, two resources with similar but not identical content and different functions have been established. The original version of the corpus has been turned into a digital library containing full electronic versions of the texts and facsimiles of the sources, while the new version features queries in modern writing and search in various sub-groups of texts (secular, religious texts, poetry, etc.). The development of both versions of the corpus is ongoing and includes specification of metadata, addition of new sources and improvements to the search capabilities.

## Conclusions

The scope and functionality of these electronic resources is constantly being broadened. Access to early texts, an important part of the Latvian language and culture, should be ensured both to researchers and to the wider community by means of three cornerstones: a corpus with an elaborated search engine, a historical dictionary and a digital library of early writings.

**SENIE** latviešu valodas seno tekstu korpuss

**LVVV**

Latviešu valodas vēsturiskā vārdnīca (16.–17. gadsimts)  
Historical Dictionary of Latvian (16<sup>th</sup>–17<sup>th</sup> Centuries)  
Historisches Wörterbuch des Lettischen (16.-17. Jahrhundert)

 Nacionālā korpusu kolekcija

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# Fear of the Consequences of COVID-19 Vaccination and Institutional Trust : Predictors of Vaccination Behaviours for Population of Latvia

Sanita Šuriņa<sup>1</sup>, Kristīne Mārtinsonē<sup>1</sup>, Viktorija Perepjolkina<sup>1</sup>

Rīga Stradiņš University, Latvia



## Introduction

Studies show that institutional trust is a contributing factor to vaccination behaviour (Al-Amer, Maneze, Everett, Montayre, Villarosa, Dwekat, & Salamonson, 2022; Marco-Franco, Pita-Barros, Vivas-Orts, González-de-Julián, & Vivas-Consuelo, 2021), while fear of the consequences of vaccination may be a barrier to COVID-19 vaccination (Rief, 2021; Hwang, Kim, & Heo, 2022).

**Aim:** The aim of this study was to investigate the role of institutional trust and fear of the consequences of vaccination as a predictor of COVID-19 vaccination behavior.

**Methods:** By using the stratified random sampling method by administrative territorial division, data were collected from a representative sample of Latvian residents (N=1017), within a framework of the national research programme 'Challenges and solutions for Latvia's state and society in an international context (INTERFRAME-LV)' in September 2021. To evaluate the institutional trust, respondents were asked: 'Please assess the extent to which you personally trust each of the institutions listed below: 1) Government, 2) News media, 3) Health care system'. The response scale ranges from 1 ('I do not trust this institution at all') to 10 ('I fully trust this institution'). To evaluate the fear of the consequences, related to COVID-19 vaccination, respondents were asked the following questions: 1) 'The onset of serious allergic reaction following the vaccine administration (e.g., anaphylaxis) 2) The onset of other severe adverse effects following the vaccine administration, 3) 'Potential unknown long-term adverse effects of the vaccine', 4) Potential adverse effect on fertility, 5) 'Potential induction of autoimmune reactions following the vaccine administration'. The response scale ranged from 1–5 ('Disagree' to 'Agree'). Age and level of education were included in the model as demographics.



## Results

Variable	B	S.E.	95,0% Confidence interval for B			p
			Exp (B)	Lower Bound	Upper Bound	
Age	-	-	-	-	-	.136
18-24	-.732	.472	.481	.191	1.212	.121
25-34	-.352	.374	.703	.338	1.463	.346
35-44	-.444	.369	.641	.311	1.321	.228
45-54	.081	.363	1.084	.532	2.209	.824
55-63	-.794	.363	.473	.232	.963	.039
64-75 (RC)	-	-	-	-	-	-
Education level	-	-	-	-	-	.000
Primary education	-1.354	.316	.258	.139	.480	.000
Secondary	-1.106	.181	.331	.232	.472	.000
Higher education (RC)	-	-	-	-	-	-
Government	.187	.042	1.205	1.109	1.310	.000
News media	-.029	.045	.972	.889	1.062	.523
Health care system	.115	.040	1.121	1.037	1.213	.004
The onset of serious allergic reaction following the vaccine administration	-.245	.106	.783	.637	.963	.020
The onset of other severe adverse effects following the vaccine administration	-.288	.143	.750	.566	.993	.045
Potential adverse effect on fertility	-.179	.085	.836	.707	.988	.036
Potential unknown long-term adverse effects of the vaccine	-.248	.129	.780	.605	1.006	.055
Potential induction of autoimmune reactions following the vaccine administration	-.065	.119	.937	.742	1.182	.583



## Conclusions

The results of this study reveal the role of government and health care in promoting vaccination, as well as the need for explanatory and educational information to reduce the fear of vaccination.



## Acknowledgments

We would like to thank the National research programme Challenges and solutions for Latvia's state and society in an international context (INTERFRAME-LV) and the research centre SKDS for data collection for our study.

Contacts: [sanita.surina@rsu.lv](mailto:sanita.surina@rsu.lv)

## References

1. Al-Amer, R., Maneze, D., Everett, B., Montayre, J., Villarosa, A. R., Dwekat, E., & Salamonson, Y. (2022). COVID-19 vaccination intention in the first year of the pandemic: A systematic review. *Journal of clinical nursing*, 31(1-2), 62-86. <https://doi.org/10.1111/jocn.15951>
2. Marco-Franco, J. E., Pita-Barros, P., Vivas-Orts, D., González-de-Julián, S., & Vivas-Consuelo, D. (2021). COVID-19, Fake News, and Vaccines: Should Regulation Be Implemented? *International Journal of Environmental Research and Public Health*, 18(2), 744. <https://doi.org/10.3390/ijerph18020744>
3. Rief, W. (2021). Fear of adverse effects and COVID-19 vaccine hesitancy: recommendations of the treatment expectation expert group. *JAMA Health Forum*, 2(4), e210804. doi:10.1001/jamahealthforum.2021.0804
4. Hwang, S. E., Kim, W. H., & Heo, J. (2022). Socio-demographic, psychological, and experiential predictors of COVID-19 vaccine hesitancy in South Korea, October-December 2020. *Human Vaccines & Immunotherapeutics*, 18(1), 1-8. doi: 10.1080/21645515.2021.1983389

## Introduction

A significant number of people around the world are suffering from long-term health sequelae after COVID-19 (Figure 1). Older age, female gender, higher body mass index, and comorbidities such as allergies and obstructive lung disease were associated with increased risk of post-COVID syndrome. However, there are still many uncertainties: the true prevalence of post-COVID and the delayed effect over a long period.



Figure 1. Patients affected by long Covid at a rally in Parliament Square, UK. <https://www.ft.com/content/e62008ff-bebf-4f9f-bc3a-9bb54991fc30>

## Research Objective

This study aimed to investigate possible long-term health sequelae after acute COVID-19 in patients hospitalized during Autumn 2020 (before the possibility of vaccination) and assessed relationships between the numbers of new symptoms, demographic factors, comorbidities, clinical tests, and severity of acute COVID-19 and its reinfection.

The study involved 51 patients (mean age  $55 \pm 12$  years) in the first follow-up visit and 44 of them in the second visit (Figure 2). Patients were interviewed using questionnaires that included a post-COVID symptoms list. Blood samples were taken.

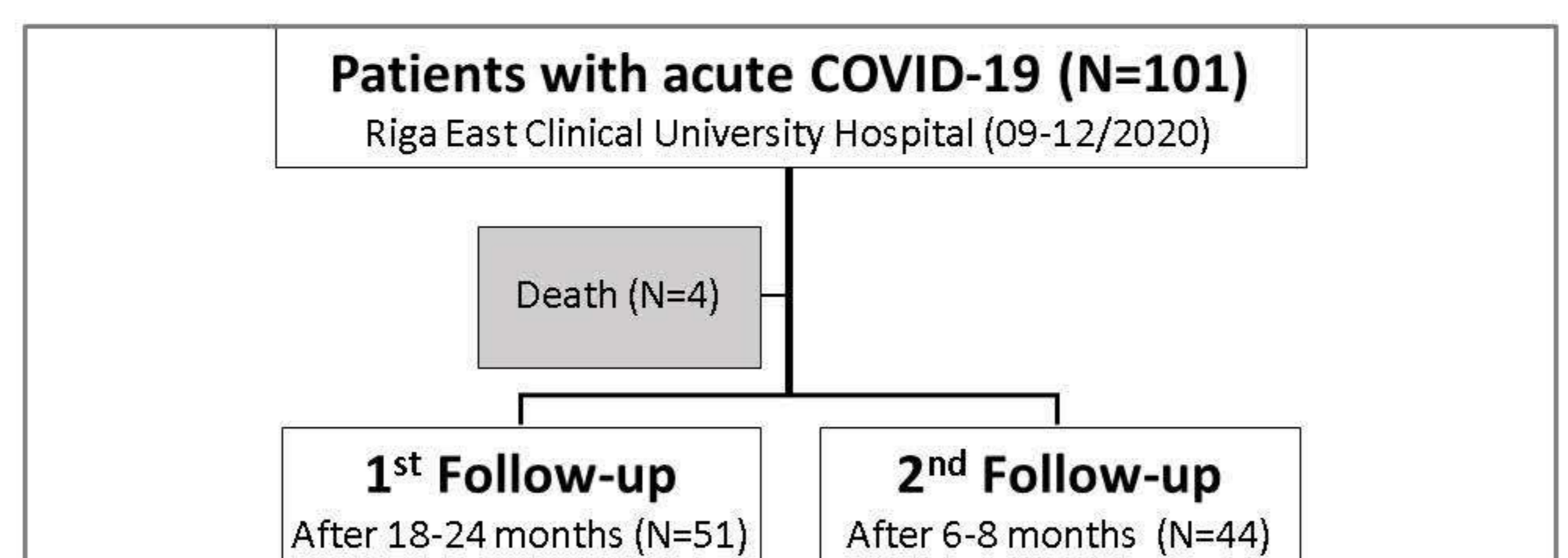
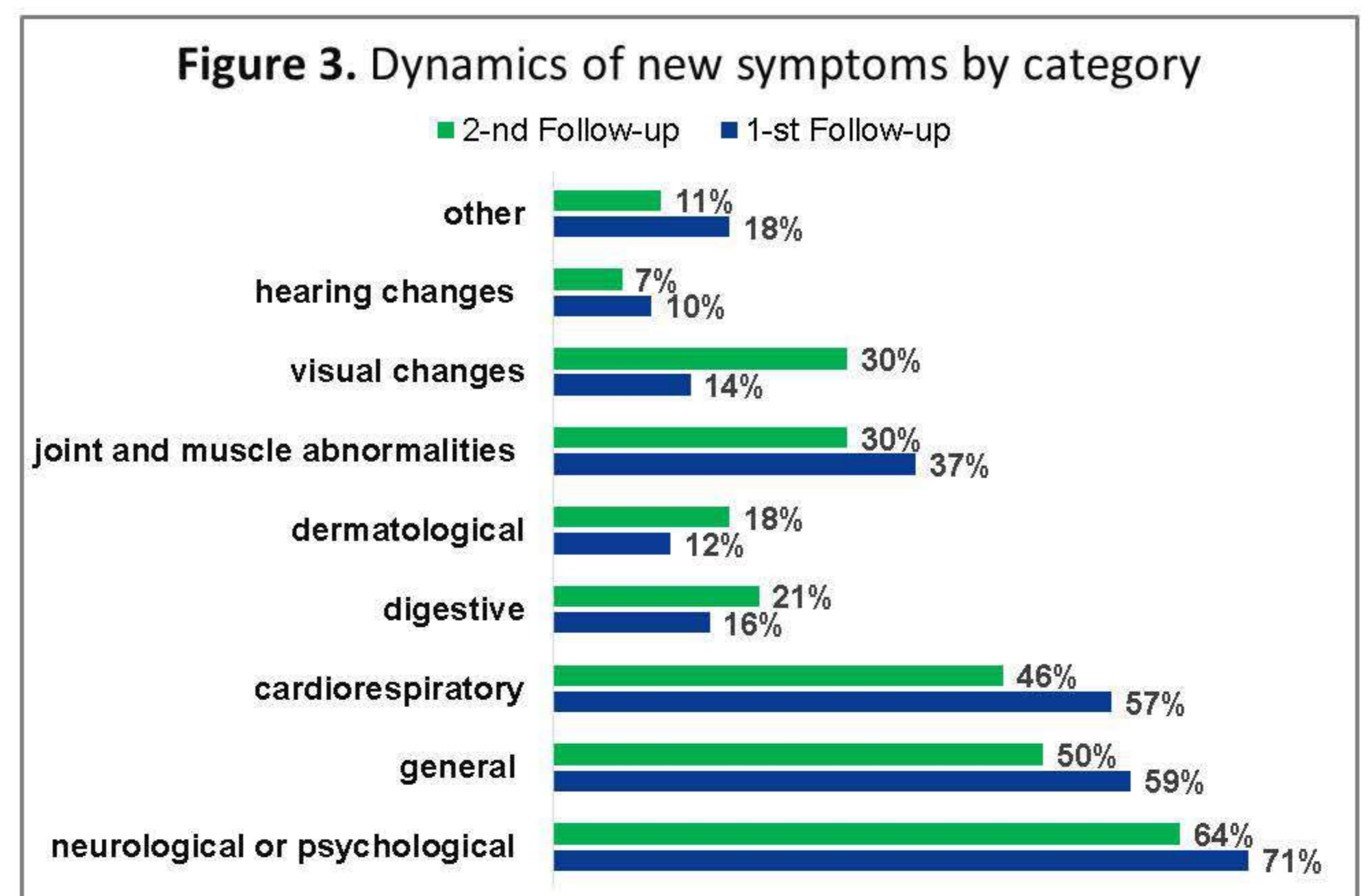


Figure 2. Study design

## Results & Discussion

Table 1. Baseline characteristics of patients

Characteristics	Number of patients (%)
<b>Sex</b>	
Male	23 (45%)
Female	28 (55%)
<b>Age, year</b>	
20–39	8 (16%)
40–59	19 (37%)
60–79	24 (47%)
≥ 80	0
<b>Comorbidities</b>	
Cardiovascular disease	40 (78%)
Chronic lung disease	6 (12%)
Diabetes	6 (12%)
Chronic liver disease	6 (12%)
Neuropsychiatric disease	11 (22%)
Arthritis	3 (6%)



After 18-24 months, only a third of patients felt recovery, with a tendency to improve over the next six months. More than half of the patients noted new neurological and psychological (71%), general (59%) or cardiorespiratory symptoms (57%) (Figure 3). The number of symptoms was not related to age, gender, pre-COVID chronic diseases, acute COVID-19 severity, and reinfection. Despite decreasing inflammatory markers after discharge (Table 2), various laboratory parameters remained altered, and 10% of patients remained immunodeficiency of unknown origin. Patients with possible post-covid had higher AST, C-reactive protein, and leukocyte levels than those with self-reported recovery.

Table 2. Dynamics of parameters after discharge (2020)

Parameters	Hospital (2020)	1 <sup>st</sup> interview (2022)	Significance
	Median	Median	
WBC, $\times 10^3/\mu\text{l}$	5.91	6.32	p=0.199
Platelet, $\times 10^3/\mu\text{l}$	185	243	p<0.001
CD4 T lymph., $\times 10^3/\mu\text{l}$	483	990	p<0.001
CRP, mg/ml	34.6	2.1	p<0.001
Ferritin, ng/ml	378	137	p<0.001
IL-6, pg/ml	15	<min	p<0.001
IFN- $\gamma$ , pg/ml	8.0	<min	p<0.001
ALT, U/l	26	25	p=0.918
AST, U/l	31	25	p=0.116
LDH, U/l	248	185	p<0.001

increasing decreasing

## Conclusions

Despite decreasing inflammatory markers and number of self-reported symptoms after discharge, various laboratory parameters remained altered. Further longitudinal investigation can help more precisely assess long-term health sequelae after COVID-19.

## Contact Information

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# Karnitīnu saturošu uztura bagātinātāju biopieejamība un metabolisms

Kristaps Krims-Dāvis, Melita Ozola, Edgars Liepiņš, Maija Dambrova

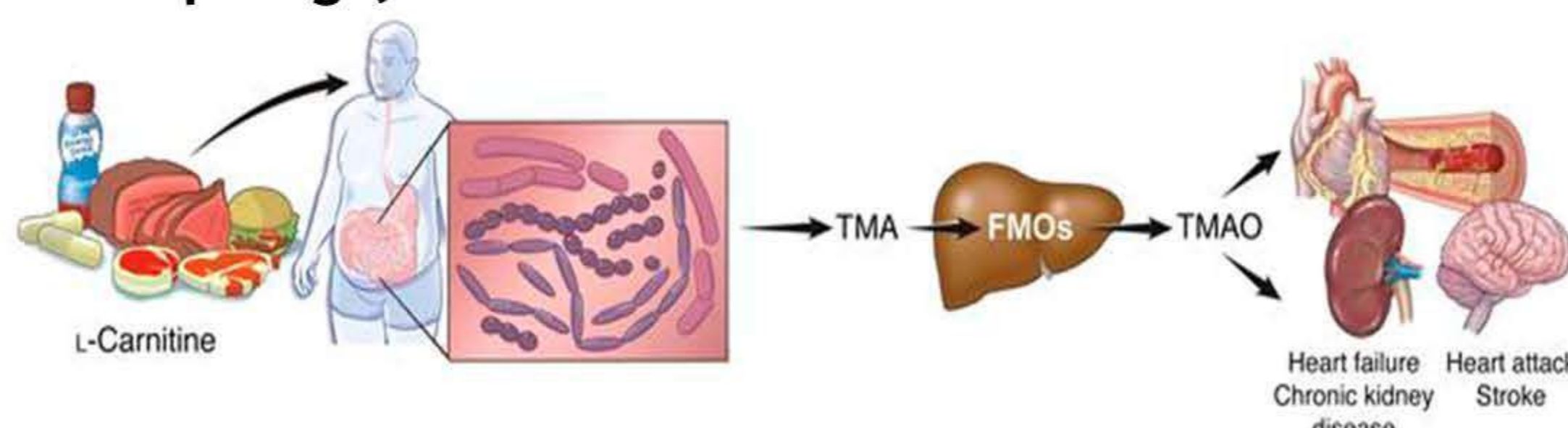
Latvijas Organiskās sintēzes institūts

## Ievads

Karnitīns pārsvarā tiek uzņemts ar pārtiku (75% no karnitīna satura organismā), piemēram, no gaļas produktiem, olām un piena, bet sabiedrībai ir pieejami dažādi karnitīna saturoši uztura bagātinātāji, kas ir ar daudz lielāku karnitīna saturu nekā pārtikā. Šie uztura bagātinātāji ir īpaši populāri atlētu vidū, kas vēlas uzlabot savu fizisko veiktspēju, neatkarīgi no profesionālā līmeņa. Lielākā daļa karnitīna, ko organisms neuzņem, tiek izvadīta ar urīnu, bet karnitīns, kas nonāk anaerobās mikrofloras vidē zarnās, tiek pārstrādāts par trimetilamīnu, kas tālāk aknās tiek oksidēts par trimetilamīna N-oksīdu (TMAO) (1.attēls).

## Pētījuma mērķis

Noskaidrot karnitīnu saturošu uztura bagātinātāju biopieejamību un metabolismu veselīgiem brīvprātīgajiem.



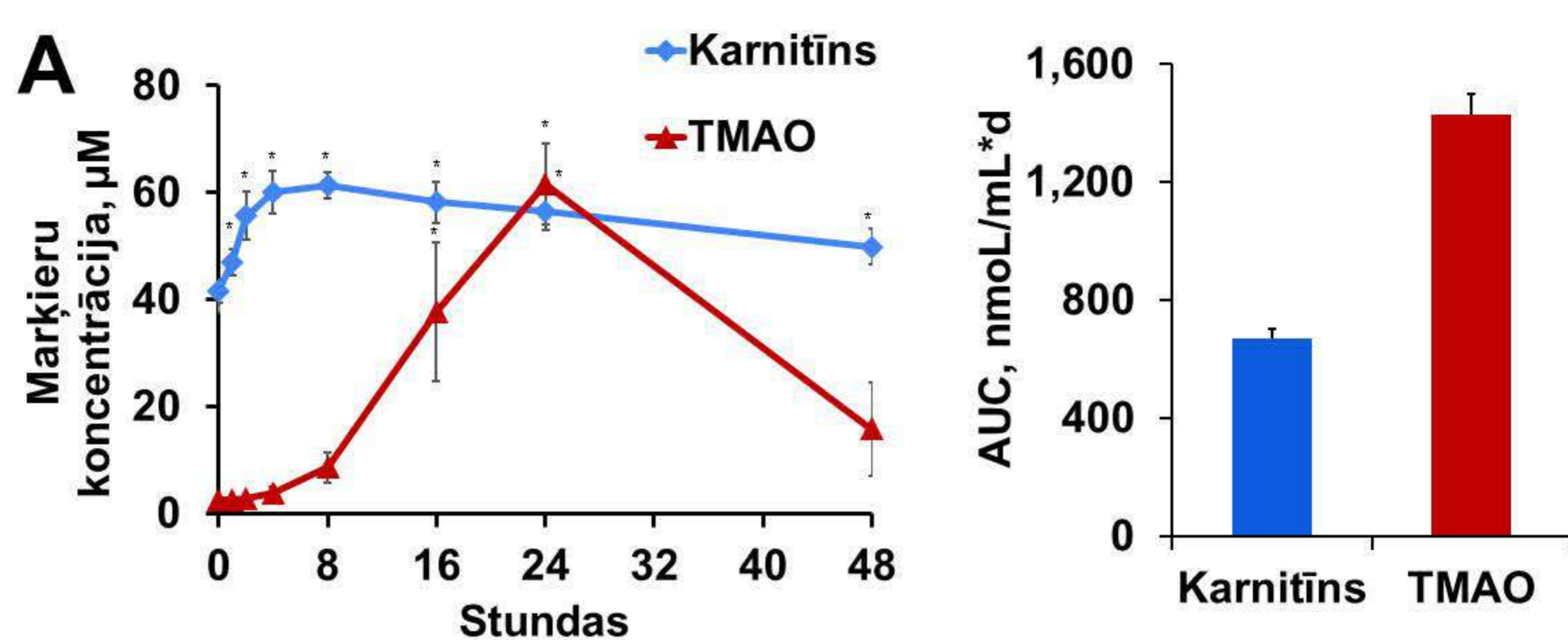
1.attēls. Vizuāls L-karnitīna metabolisma attēlojums

Attēls pielāgots no: Robert A. Koeth, et al., L-Carnitine in omnivorous diets induces an atherogenic gut microbial pathway in humans. *J. Clin. Invest.* 2019. 129, 373-387.

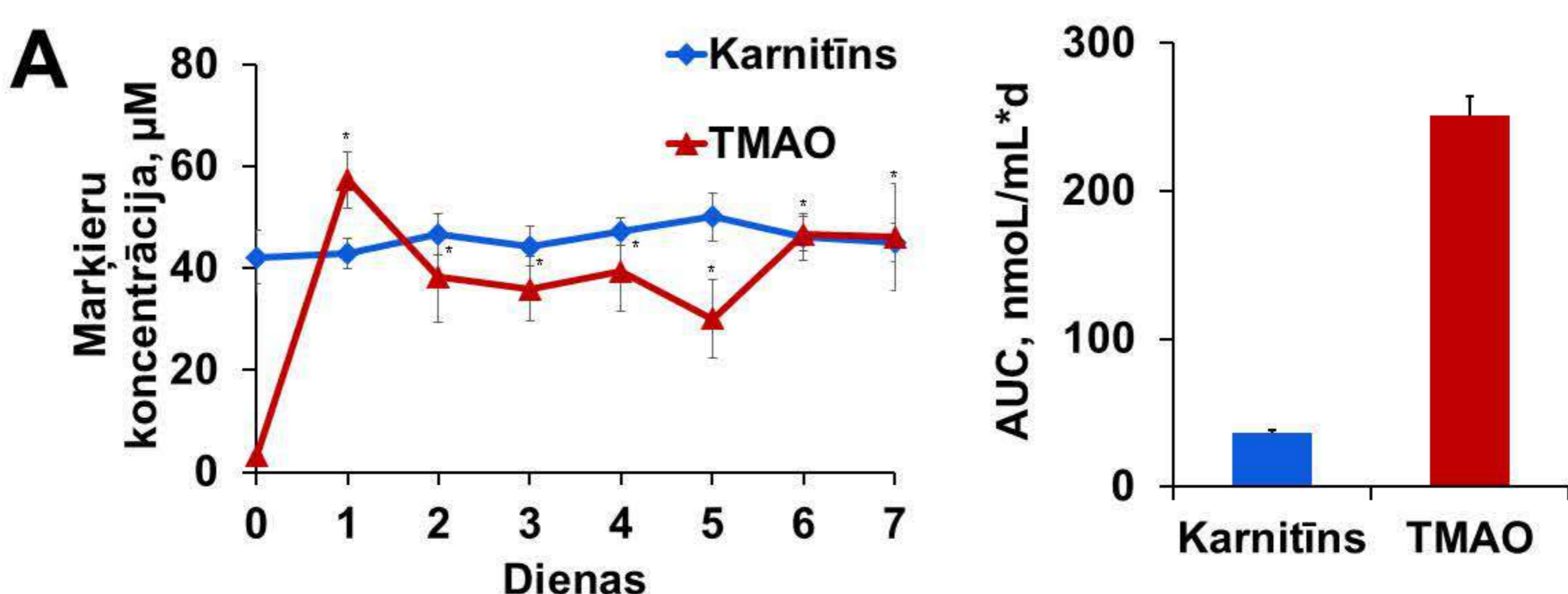
3-5  $\mu\text{M}$     5-7  $\mu\text{M}$     >7  $\mu\text{M}$

2.attēls. TMAO plazmas koncentrāciju gradients.

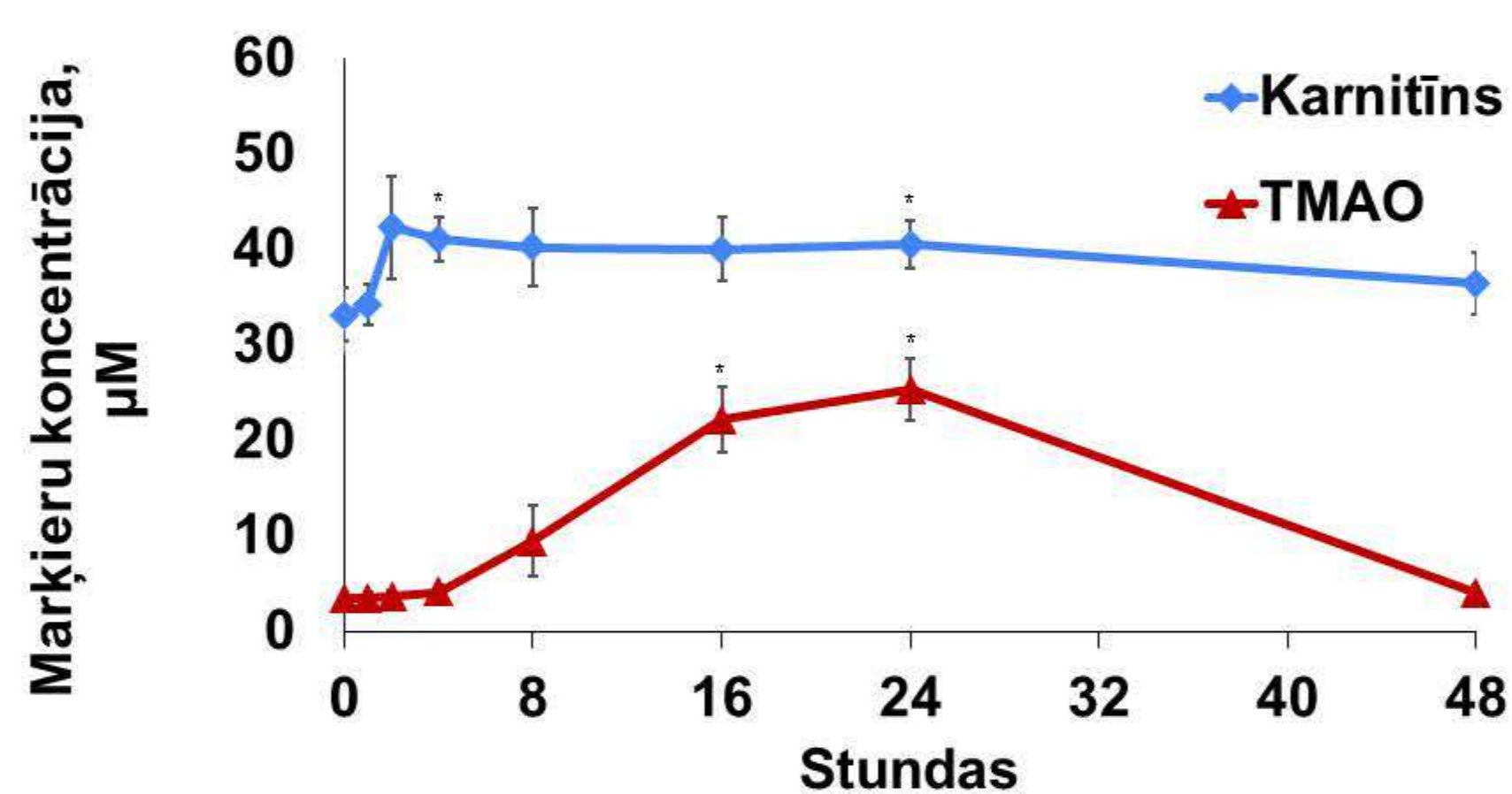
## Rezultāti



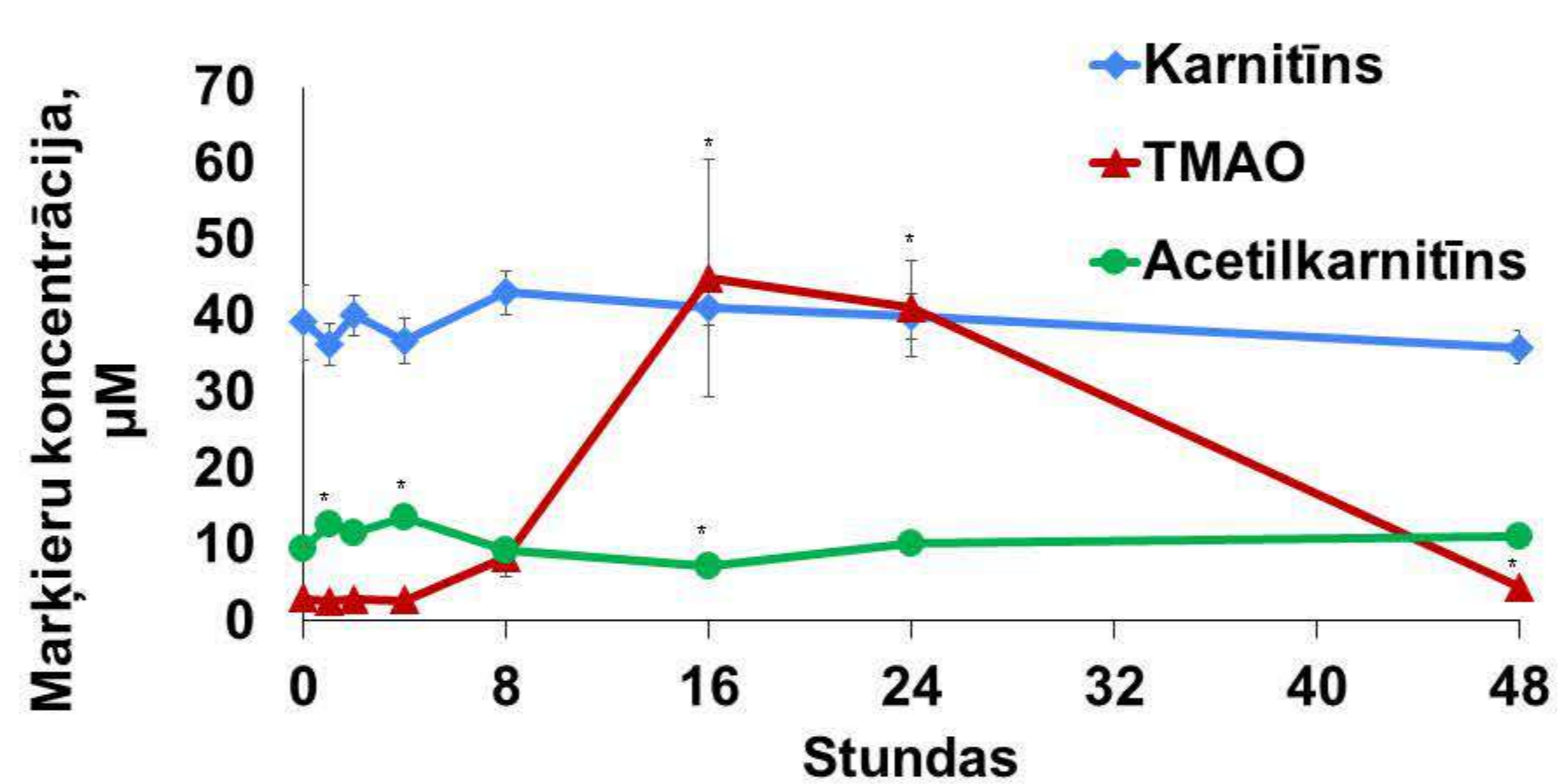
3.attēls. Karnitīna (1500mg) vienas devas uzņemšanas ietekme uz karnitīna un TMAO koncentrāciju plazmā (A) un urīnā (B). Attēlotas vidējās vērtības no mērījumiem 10 voluntieros ar vidējās vērtības standartklūdu, \*  $p < 0,05$ .



4.attēls. Karnitīna (1500mg) atkārtotas uzņemšanas izraisītās karnitīna un TMAO plazmas (A) un urīna (B) koncentrāciju izmaiņas paraugos pa dienām. Attēlotas vidējās vērtības no mērījumiem 6 voluntieros ar vidējās vērtības standartklūdu un vidējo rezultātu katrā no 7 pētījuma dienām, \*  $p < 0,05$ .



5.attēls. Karnitīna (500mg) vienas devas uzņemšanas ietekme uz karnitīna un TMAO koncentrāciju plazmā. Attēlotas vidējās vērtības no mērījumiem 11 voluntieros ar vidējās vērtības standartklūdu, \*  $p < 0,05$ .



6.attēls. Acetil-karnitīna (1500mg) vienas devas uzņemšanas ietekme uz karnitīna, TMAO un acetil-karnitīna koncentrāciju plazmā. Attēlotas vidējās vērtības no mērījumiem 11 voluntieros ar vidējās vērtības standartklūdu, \*  $p < 0,05$ .

## Secinājumi

Karnitīnu saturošu uztura bagātinātāju uzņemšana ievērojami izteiktāk paaugstina TMAO nekā karnitīna koncentrāciju organismā. Pēc karnitīna saturošu uztura bagātinātāju vienreizējas uzņemšanas vairāk nekā 90% uzņemtā karnitīna metabolizējas līdz TMAO un tiek izvadīts ar urīnu. Atkārtoti lietojot karnitīnu saturošus uztura bagātinātājus, tiek sasniegtas plazmas TMAO koncentrācijas, kas ir saistāmas ar augstu kardiometabolo slimību risku.



# Sieviešu pārstāvniecība Latvijas politikā

Laura Dīne (Dean), Politikas zinātnes asociētais profesors un Cilvēku tirdzniecības pētniecības laboratorijas direktors  
Millikina universitāte, ASV

## Ievads

Pētījums ir par sieviešu pārstāvniecību Latvijas politikā, Latvija ieņem 20. vietu pasaulē globālajā dzimuma atšķirību noslēgšanas ziņojumā, un piekto vietu Austrumeiropā sieviešu pārstāvības ziņā. Latvijai nav konstitūcijā vai likumā noteiktas dzimumu kvotas, lai veicinātu dzimumu līdztiesību politikā. Lai gan šķiet, ka Latvijā ir augsts dzimumu līdztiesības līmenis, es atklāju, vai lielais sieviešu deputātu skaits pieaugums Saeimā maina Latvijas politiku.

No pirmā acu uzmetiena šķiet, ka Saeimā dominē sievietes, kas demonstrē simbolisku pārstāvniecību, taču, rūpīgāk apskatot spīkera un citu prezidija locekļu ierobežotās pilnvaras, var secināt, ka, lai gan sievietes ir redzamas Latvijas Saeimā, viņas joprojām ir izslēgtas no politiski spēcīgākajiem amatiem.

## Rezultāti un diskusija

Table 1: Impact of Gender on Preferential Voting in the 12<sup>th</sup> Saeima Election

Independent Variables	Plus	Minus	Total Preference Votes
Female	-97.6* (37.73)	-37.11 (53.25)	-82.18* (28.65)
Incumbent	3003.86* (66.3)	1474.33* (93.58)	680.87* (50.35)
Party List Placement	924 (2.66)	12.4* (3.75)	-13.58* (2.02)
Party Ideology	3.1 (20.68)	144.45* (151.60)	-138.66* (15.70)
Kurzeme	151.60* (57.02)	142.52 (80.47)	56.66 (43.3)
Cumulative Party List Number	15.32* (2.56)	27.77* (3.62)	-4.27* (1.95)
Age	23.6* (9.001)	41.39* (12.71)	-4.94 (6.83)
Age Squared	-0.219* (0.097)	-0.382* (0.136)	0.053 (0.73)
Constant	-434.20	-1272.31	451.96
Standard Error	(203.58)	(287.34)	(154.60)
Number of Cases	1156	1156	1156

Note: Robust Standard Regression on where significance levels \* < .05 with Standard Errors are in parentheses. R-squared for Model 1 is: .68608823, Model 2 is: .29912605, and Model 3 is: .29848776.

Table 2: Impact of Gender on Preferential Voting in the 13<sup>th</sup> Saeima Election

Independent Variables	Plus	Minus	Total Preference Votes
Female	-25.18 (32.05)	-57.17* (24.89)	30.17 (25.33)
Incumbent	891.71* (58.83)	636.16* (45.68)	299.16* (46.5)
Party List Placement	-12.87* (2.15)	5.83* (1.67)	-19.62* (1.7)
Party Ideology	-72.18* (17.002)	37.38* (13.2)	-114.33* (13.44)
Kurzeme	222.59* (49.16)	132.34* (38.17)	99.4* (38.36)
Cumulative Party List Number	31.42* (2.02)	26.8* (1.57)	8.67* (1.6)
Age	17.82* (7.1)	17.88* (5.51)	-35 (5.61)
Age Squared	-0.224* (0.072)	-0.207* (0.056)	-0.186 (0.057)
Constant	-246.44	-555.5	278.65
Standard Error	(168.63)	(130.94)	(133.29)
Number of Cases	1461	1461	1461

Note: Robust Standard Regression where significance levels are \* < .05 and Standard Errors are in parentheses. R-squared for Model 1 is: .32432161, Model 2 is: .37812571, and Model 3 is: .18956471.

1. tabulā redzams, ka sieviešu kandidātēm ir negatīva saistība ar kumulatīvo priekšrocību balsošanas rezultātiem 2014. gadā (-82,18), kas liecina par būtiskām atšķirībām starp vīriešu un sieviešu kandidātiem šajās vēlēšanās. Sievietes retāk saņēma plusus un mīnus, un saistība starp dzimumu un priekšrocību balsošanu bija pārliecinoši negatīva un statistiski nozīmīga. 2. tabulā parādīts, ka sieviešu kandidātēm ir pozitīva saistība ar kumulatīvo balsošanas rezultātu 2018. gadā (+30,17), un tas parāda, kāpēc 2018. gadā tika ievēlēts vairāk sieviešu. Piecās no sešām tēmām sieviešu deputātes tika pārtrauktas biežāk nekā viņu vīriešu kolēģi (izglītība, drošības dienests un aizsardzība un budžets) 12. un 13. Saeimā. Sieviešu skaita pieaugums izraisīja pretreakciju, kurā sievietes tika pārtrauktas biežāk, arī tad, kad parlamentā bija vairāk sieviešu.

## Secinājumi

Rezultāti parāda, ka Latvijas vēlētajiem nav konsekventi neobjektīvi pret sieviešu kandidātēm, jo notiek pārmaiņas no pārsvarā negatīvām atzīmēm sievietēm 2014. gadā uz pārsvarā pozitīvām 2018. gadā. Mani atklājumi parāda, kā vēlēšanu noteikumi un likumdošana veido dzimumu atšķirības un kā Latvijas vēlētajiem var uzlabot neobjektivitāti politisko partiju vidū, taču šo preferenču saglabāšanās varētu būt vienreizēja parādība. Parlamenta debašu dati liecina, ka 13.Saeimā tika pārtraukti 63% sieviešu deputāšu runu, salīdzinot ar 38% 12.Saeimā. Līdz ar to, pieaugot sieviešu pārstāvniecībai, sievietes parlamentā nekļuva vairāk atstumtas Saeimā.

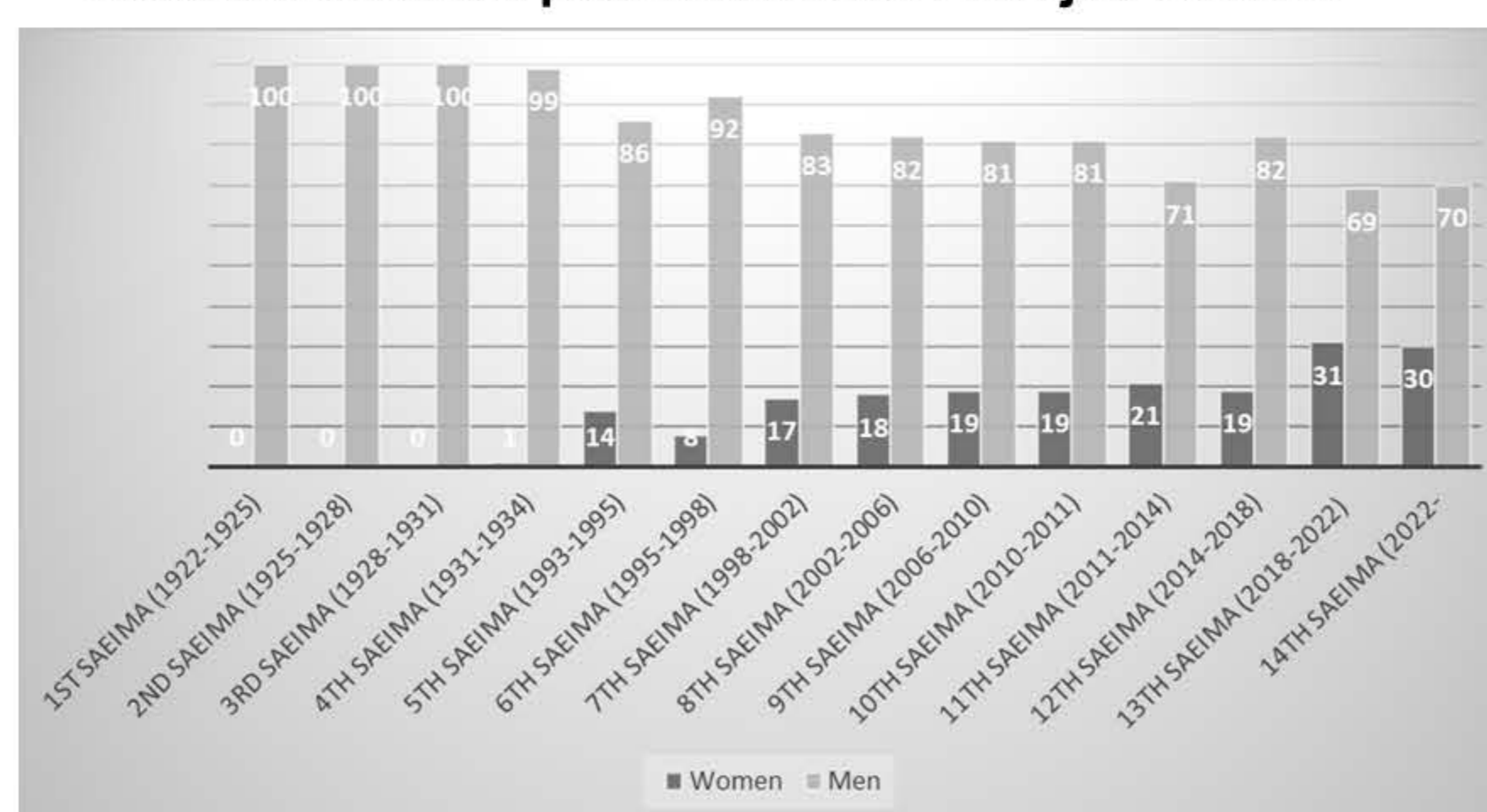
## Kontaktinformācija

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## Pētījuma mērķis

Šis pētījums koncentrējas uz Saeimu kā uz dzimumu orientētu telpu ikdienas politiskajām lietām un politiskajai pasaulei Latvijā. Es pētīju sieviešu ikdienas politisko dzīvi Latvijas Saeimā, izmantojot etnogrāfiskas metodes, lai noskaidrotu, kā deputāti ikdienā veicina dzimumu līdztiesību politiskajās institūcijās, kuras veidojuši vīrieši. Galvenais pētījuma jautājums pēta, kā sieviešu pārstāvniecības pieaugums Saeimā ietekmē formālās un neformālās politiskās institūcijas Latvijā.

1. attēls: Sieviešu pārstāvniecība Latvijas Saeimā



2. attēls: 2014. gada preferenciālo vēlēšanu rezultāti sievietēm un vīriešiem pēc vēlēšanu apgabala



3. attēls: 2018. gada preferenciālo vēlēšanu rezultāti sievietēm un vīriešiem pēc vēlēšanu apgabala



Table 3: Speeches and Interruptions in the 12<sup>th</sup> Saeima by Gender

	12 <sup>th</sup> Saeima Education	12 <sup>th</sup> Saeima Security	12 <sup>th</sup> Saeima Budget	Total
Women	79/214 (37%)	14/18 (78%)	49/143 (34%)	142/375 (38%)
Men	250/556 (45%)	68/763 (9%)	558/3,468 (16%)	876/4,787 (18%)

Note: Debate transcripts were coded by type of interruption. The calculations show the number of interruptions/number of speeches and the percentage is the rate of interruptions for women and men by debate them.

Table 4: Speeches and Interruptions in the 13<sup>th</sup> Saeima by Gender

	13 <sup>th</sup> Saeima Education	13 <sup>th</sup> Saeima Security	13 <sup>th</sup> Saeima Budget	Total
Women	69/151 (46%)	23/25 (92%)	97/124 (78%)	189/300 (63%)
Men	102/510 (20%)	92/465 (47%)	395/843 (47%)	589/1,815 (32%)

Note: Debate transcripts were coded by type of interruption. The calculations show the number of interruptions/number of speeches and the percentage is the rate of interruptions for women and men by debate them.

PhD Kristīne Šneidere  
Riga Stradiņš University

## The relationship between cognitive reserve and memory in older adults: a structural equation model

### Introduction

Years 2021 – 2030 is the **United Nations Decade of Healthy Ageing** that aims to bring together governments, civil society, international agencies, professionals, academia, the media and the private sector to endorse the activities needed for improving the lives of older and ageing adults, their families and the communities (WHO, 2022)

Increased age is still considered to be among the main risk factors for developing a neurodegenerative disease (Hou et al., 2019) and currently there are no pharmacological methods for the treatment of, e.g. Alzheimer's Disease or dementia.

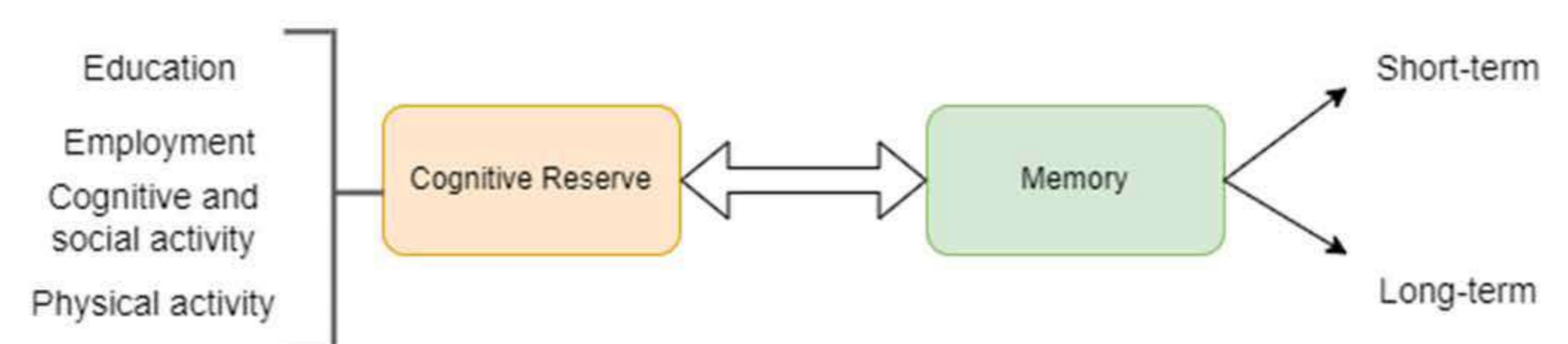
Nevertheless, the past two decades have highlighted the importance of involvement in intellectual, physical and social life-style activities or **cognitive reserve** (Livingston et al., 2020)

### Research Objective

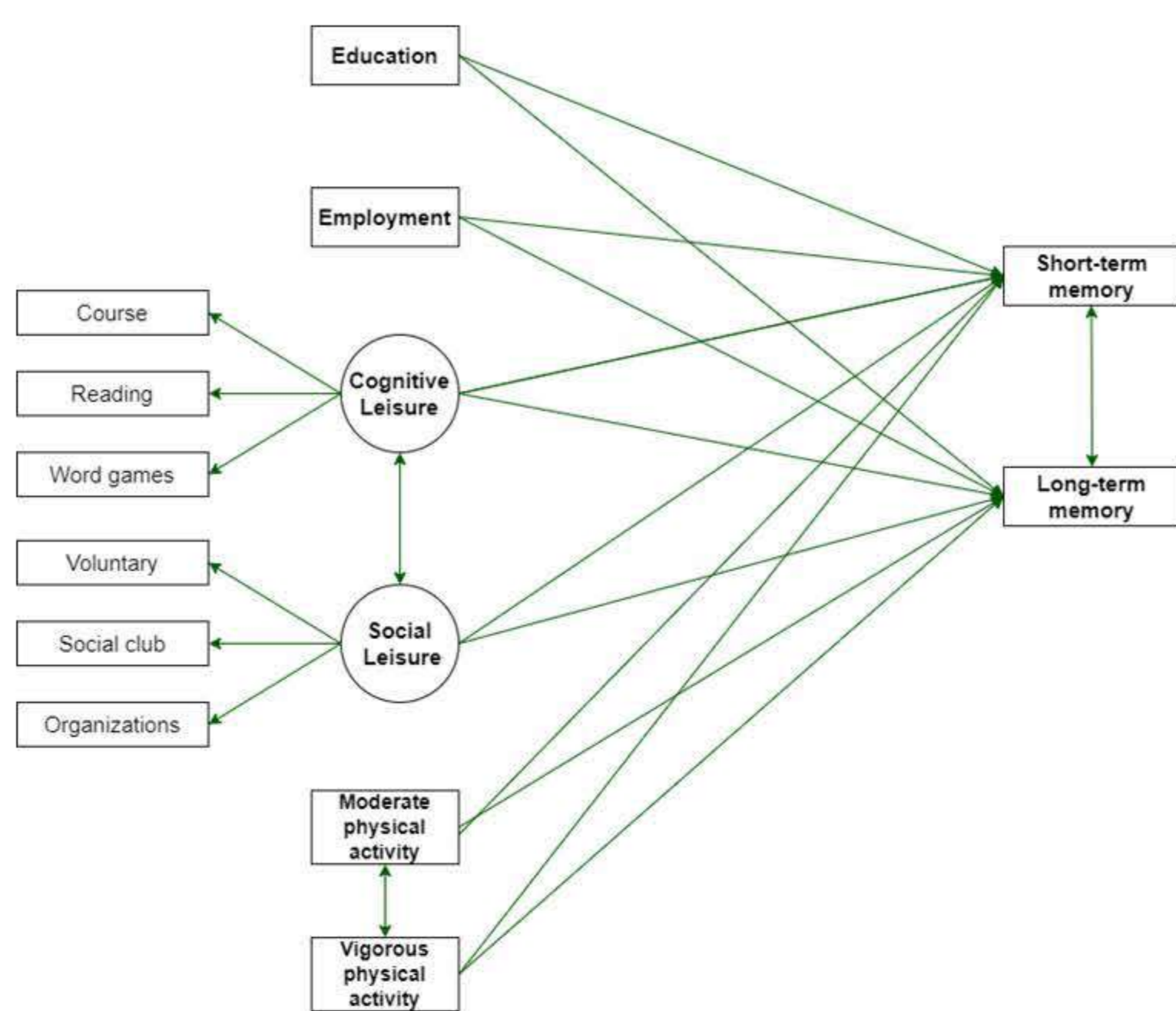
The objective of the study was to investigate the relationship between **socio-behavioural proxies of cognitive reserve and memory** in a partially representative sample of Latvian adults aged 40+.

**Hypothesis:** Higher levels of education, active employment and active daily life-style will be associated with better short- and long-term memory performance.

Secondary data from the SHARE Wave 8 (Bergmann & Börsch-Supan, 2022; A. Börsch-Supan, 2022; Axel Börsch-Supan et al., 2013)

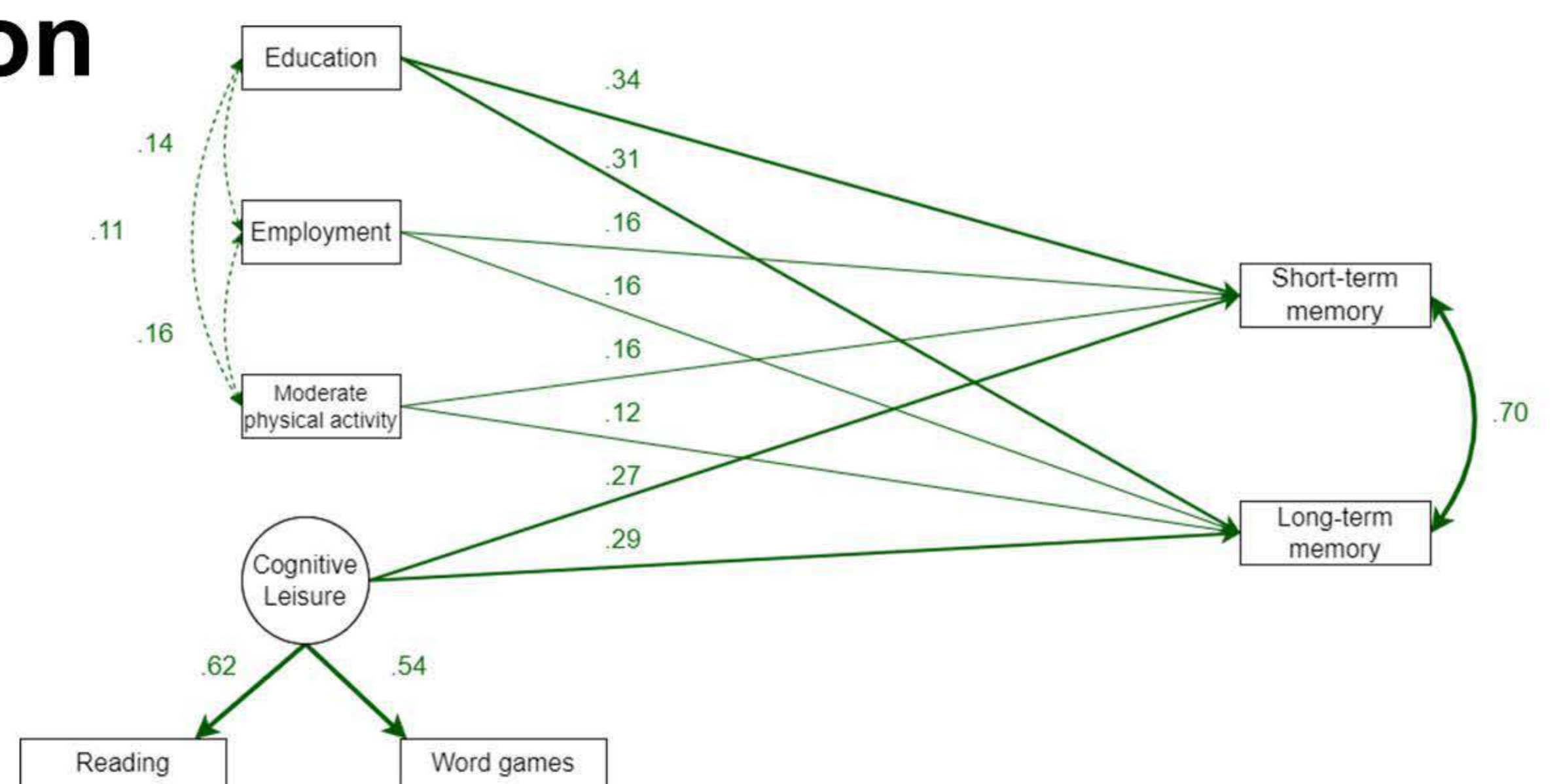


### Results & Discussion



Conceptual model

546 native Latvian speaking participants with no self-reported neurodegenerative disease, stroke or ongoing oncological disease ( $M_{age} = 70,54$ ,  $SD = 10,19$ , 37,2% male) from the SHARE-project Wave 8 were included in data analysis.



Tested model  
(SEM, using R 4.2.1., lavaan package)

$\chi^2(7) = 30.837$ ,  $CFI = .970$ ,  $RMSEA = .079$ ,  $SRMR = .058$

### Conclusions

Higher levels of education, current employment, active reading and doing crossword puzzles, as well as involvement in moderate intensity physical activity might be associated with better short- and long-term memory performance.

### Contact Information

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### List of References



# Computation, characterization, and identification of nonlinear localized waves in crystal lattice models

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## Introduction

In this work, we study crystal lattice models of classical molecular dynamics, which exhibit *intrinsic localized mode* (ILM) solutions, also known as *discrete breathers* (DBs). Such nonlinear localized waves are of particular interest in material science, where the transport of charge in silicates by moving nonlinear localized excitations is experimentally confirmed. The phenomenon is called *hyperconductivity*.

The research objectives are threefold. The first objective involves data-driven classification of locally sampled lattice wave data using the Support Vector Machine (SVM) algorithm and identification of the localization regions in numerical simulations with the application of a sliding window method [1], Fig. 1. The second objective is to develop efficient structure-preserving time integration numerical methods for computations of charge transfer by discrete breathers [2], Fig. 2. The third objective is to obtain and characterize spectra of numerically exact stationary and moving discrete breather solutions, including charge transfer [3], Fig. 3.

## Results: Figs. 1-3.

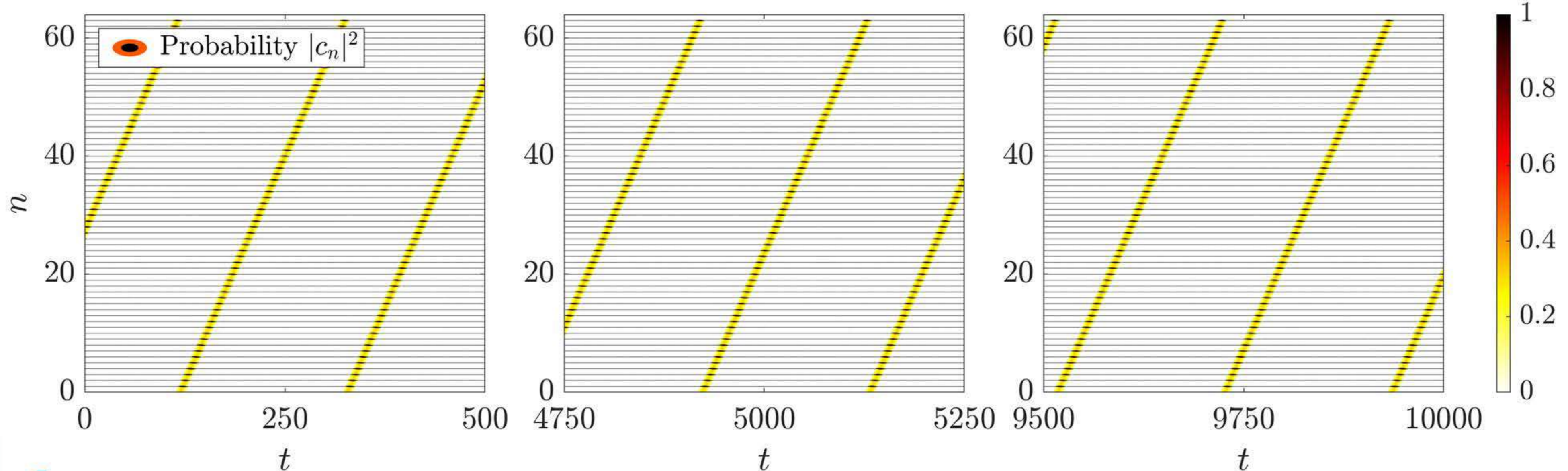


Fig. 1. Detection of localization regions in a numerical simulation of two DBs. Particles of detected regions are identified by red dots.

## Conclusions

We have proposed a data-driven methodology for the detection of localization regions in crystal lattice numerical simulations considering dimensionality reduction techniques in combination with the machine learning classification algorithm and sliding window approach [1]. The developed structure-preserving time integration and optimization methods allow numerical simulations and computation of long-lived numerically exact discrete breather solutions transporting charge [2,3]. Analysis and spectral characterization of nonlinear localized lattice wave solutions provide knowledge to identify bands in the spectra of physical materials, where nonlinear vibrations couple to non-free charges [3].

## References

1. J. Bajārs and F. Kozirevs. Data-driven intrinsic localized mode detection and classification in one-dimensional crystal lattice model. *Physics Letters A* **436**:128071, 2022.
2. J. Bajārs and J.F.R. Archilla. Splitting methods for semi-classical Hamiltonian dynamics of charge transfer in nonlinear lattices. *Mathematics*, **10** (19):3460, 2022.
3. J.F.R. Archilla and J. Bajārs. Spectral properties of exact polarobreaters in semiclassical systems. *Axioms*, **12** (5):437, 2023.

## Hamiltonian Dynamics

The one-dimensional crystal lattice model of  $N$  particles is described by the dimensionless Hamiltonian [1-3]:

$$H_L = \sum_{n=1}^N \left( \frac{1}{2} p_n^2 + U(u_n) + V(1 + u_{n+1} - u_n) \right).$$

An extra charge, electron or hole, is modeled as a quantum particle using *tight-binding approximation* with the Hamiltonian [2,3]:

$$H_c = \sum_{n=1}^N (E_n c_n^* c_n - J(u_{n+1} - u_n) [c_n^* c_{n+1} + c_{n+1}^* c_n]),$$

where  $|c_n|^2$  is the probability that the charge is located at site  $n$ . Thus, the total Hamiltonian  $H = H_L + H_c$ .

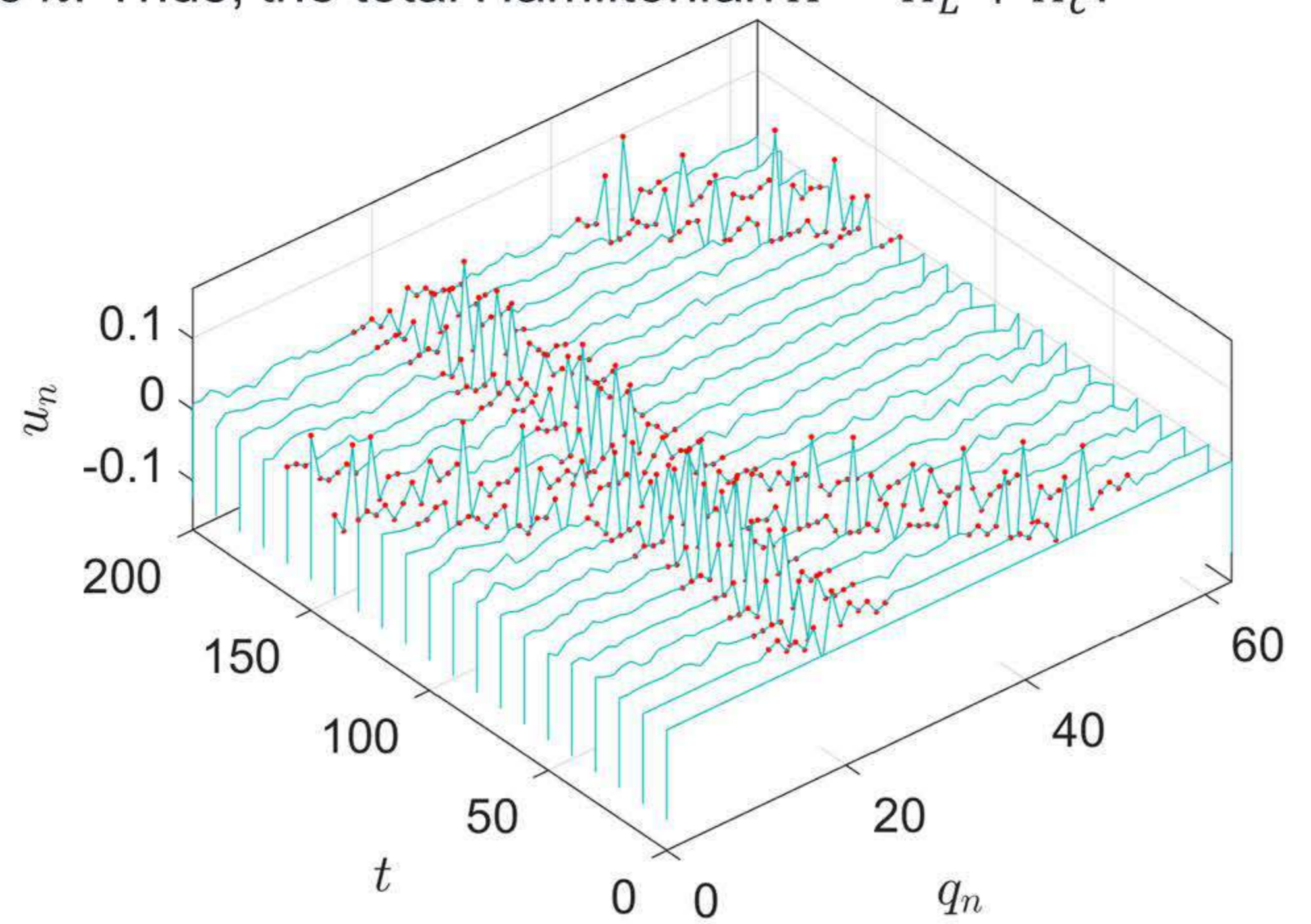


Fig. 2. Long-time simulation of numerically exact moving discrete breather carrying charge.

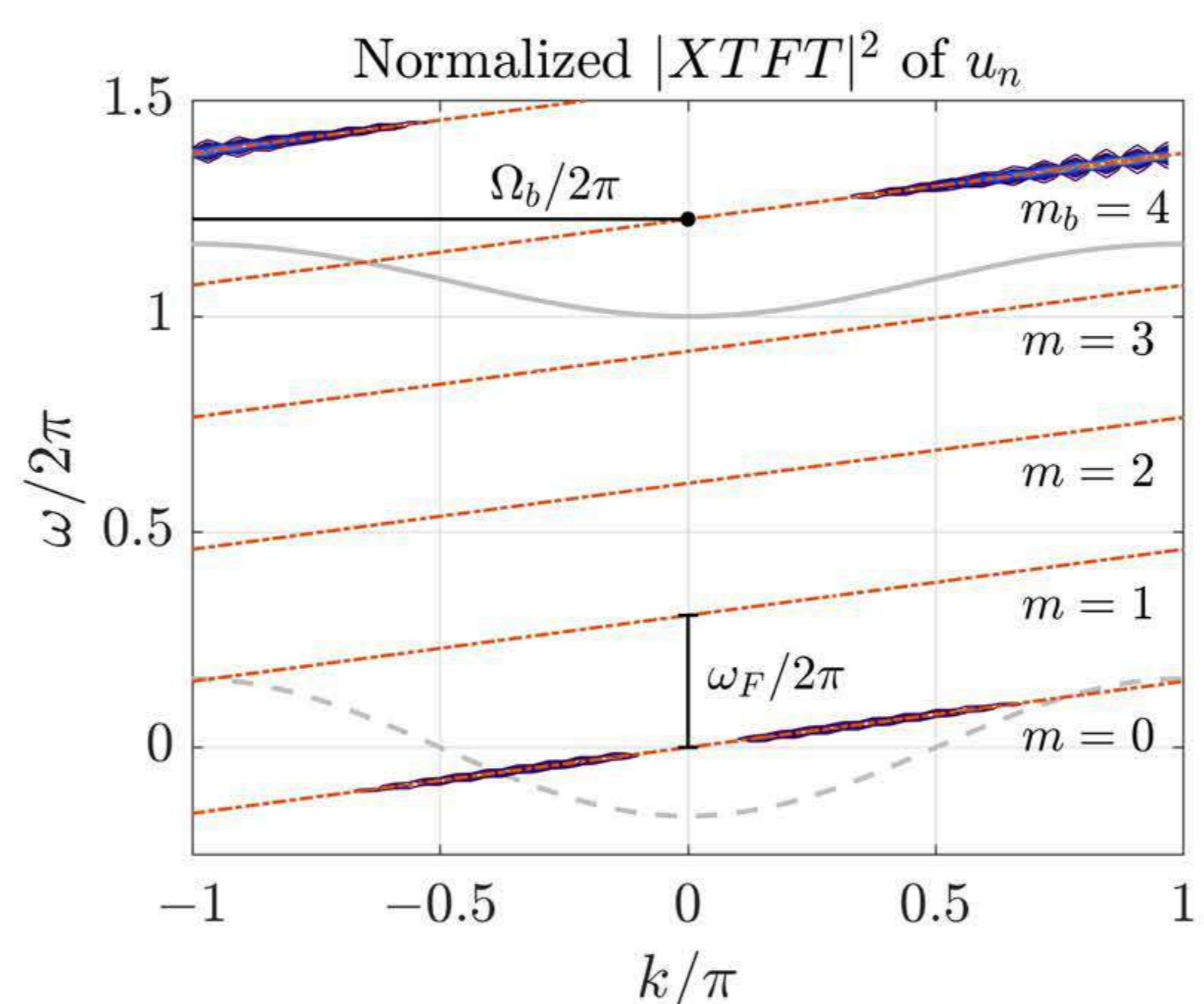


Fig. 3. Two-dimensional discrete Fourier transform in positions and time (XTFT) allows one to characterize numerically exact discrete breather solutions and obtain valuable information, such as the breather frequency in the moving frame, the fundamental time and frequency, the step, breather velocity, and determine the breather and resonant lines.

# Why young talented Latvians chose to leave Latvia to study and build careers abroad

Sabine Dreibe

Independent researcher

## Introduction

Latvia is a small country, therefore it could be expected and assumed that no large scale research could be happening at this moment due several different and some correlating factors.

It is well known that there are great minds coming from Latvia that excel in different sectors - medical, political, engineering, arts ect. Unfortunately over the years large number of these great minds and talented students have made a decision to study and build their careers abroad, which could be slowing a potential growth of science in Latvia.

An interviews consisting of 3 simple questions were conducted with Riga's State Gymnasium no.1(RV1G) graduates studying and/or working abroad .

## Results & Discussion

Every year on average  $\frac{1}{3}$  of students graduating RV1G leave to study abroad. Of these approximate 80 students only 3 might return back and then 2 (of those 3 who returned) will leave again after a while.

In addition to those who leave straight after graduating to start their undergraduate studies, approximately 25 of those who chose to obtain their BSc in one of Latvian universities will leave to obtain their MSc's and PhD's abroad without returning. Most of the students over the years have chosen United Kingdom(UK), now after Brexit students tend to apply for universities in Sweden, Norway, Netherlands and other well know universities in European Union( EU).

### Why did you chose to leave Latvia and study abroad?

#### • Style and quality of education available abroad

The majority of education provided in Latvian Universities are old school in a lot of and tailored for career in Latvia.

**The exam** system in **first year of university** is not tailored to make the students get used to the new educational system, which further leads to many students dropping out before or just after the first exam session in many important study programs, for example, BSc in Mathematics at Latvian University(LU), approximately 1/2 of students tend to drop out in first year against standard UK BSc mathematics over the course of 3 years up to 2 students would chose to leave the course.

For example, UK university system is set up to ease students into new life **and first year grades do not count towards** the degree being awarded and the minimum requirement is to **pass the module- obtain 40% overall mark** ( module grade consist of 70% course work 30% exam).

In addition respondents who obtained their undergraduate degrees in Latvia stated that they felt that they did not get strong enough background to be able to compete with graduates , for example, from United Kingdom, Sweden and Germany.

#### • Lack of cancer research, medical statistics, engineering and other common degrees offered abroad.

There is only one and recent MSc program offered by LU in Epidemiology and Medical Statistics which has no funding from government. A lot of the new modern engineering and sustainability courses are not available in Latvia whereas there is a wide choice abroad - Sweden, Norway and other EU countries which offer great studentships covering study fees and living costs.

## Conclusions

There are many young talented Latvians leaving to study and build career abroad due to few simple reasons discussed above.

In general it is due to not enough funding in research area, which leads to only few job available and salary that is not able to compete with those offered abroad.

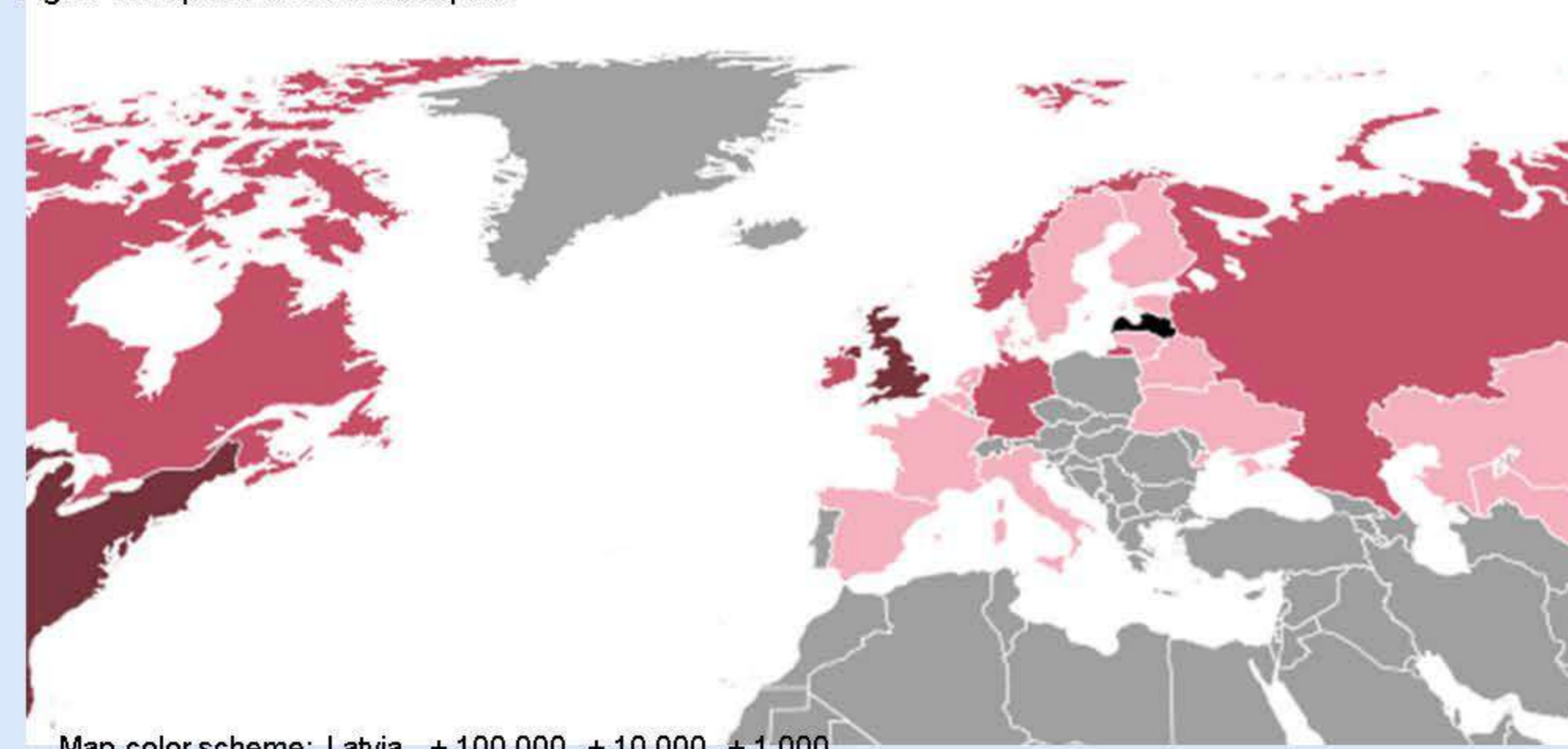
Another major reason is the quality and style of education at university level available in Latvia that is mainly described as old school.

This small research is based on only answers form RV1G graduates and only displays a small proportion of students leaving Latvia and choosing to stay abroad.

## Research Objective

- Determine reasons **why young talented Latvians are choosing to study abroad**
- Determine reasons **why after finishing studies Latvian graduates abroad are choosing to build their career there** instead of returning home
- Determine reasons **why those who have returned to Latvia decide to leave again**
- **Provide potential solutions that could solve some of these issues**

Figure 1: Map of the Latvian diaspora.



### When leaving Latvia is/ was there a plan to return after finishing studies?

Most of the respondents answered that they **have no desire returning** back home. Reasons for staying abroad after graduation mainly included **research career** in sectors that Latvia currently are lacking and **the large salary gap** for junior roles, wider range of **available jobs** , **no jobs in desired career available in Latvia**.

In additions **some of the respondents had returned to Latvia** after finishing studies abroad , but unfortunately **after a year or two they decided to leave** as there were **not a lot of career options**, to large salary gap in research related career, and they felt that their **knowledge and experience is not enough valued and recognised**.

### What should change in Latvia to convince you to return?

#### **MORE FUNDING IN CLINICAL RESEARCH AREA .**

According to EU Clinical trials register there are currently **1314 clinical trial in Latvia** whereas the average number of open ongoing trials in , for example, **Royal Marsden Cancer hospital in UK** ≈ 500( per year). In addition, when looking for a clinical trial position ( statistician coordinator, trial manager) there are not many jobs available and those that can be found do not have salary specified, are for an international company or simply some roles are nowhere to be found.

#### • **MORE SUSTAINABLE , MODERN ENGINEERING JOBS AND UNIVERSITY COURSES**

Some of the respondents left to study engineering further as there were no study programs available in Latvia that would provide what they were looking for. They mentioned that they would return if their area of engineering would offer more jobs and opportunities in Latvia.

#### • **LARGE PAY GAP**

The main factor mentioned was the large pay gap in industries these respondents are representing. Junior medical statistician working in clinical trials in UK is earning approximately £40 000p.a. whereas the offered pay in Latvia is around €12 000 p.a. – the pay gap is extremely large and even when progressing through roles it keeps just getting larger.

#### • **CULTURE**

Another factor which is difficult to change and would take long time and several generations is the culture. All respondents mentioned that living abroad they feel more happier, accepted and free. People are more positive, they tend to focus on positives instead of negatives.

All respondents mentioned if the Latvian society would become more open, friendlier, happier and in general more positive with addition of the previously mentioned factors, they would most likely return back home to help and make Latvia a nicer place to live and a modern, growing country.

## Contact Information

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# BRAF and NRAS mutations correlation with melanoma prognostic histopathological factors

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## Introduction

Cutaneous melanoma (CM) is one of the most dangerous tumours. BRAF (60%) and NRAS (18%) gene mutations are the most frequent somatic point mutations occurring in CM, and histopathological factors have been used for the assessment of prognosis.



## Research Objective

Our aim was to determine tumour mutational status and evaluate correlations between mutations and such prognostic histopathological factors like mitotic rate (MR), lymphocyte infiltration and presence of multinucleated cells (MC's).

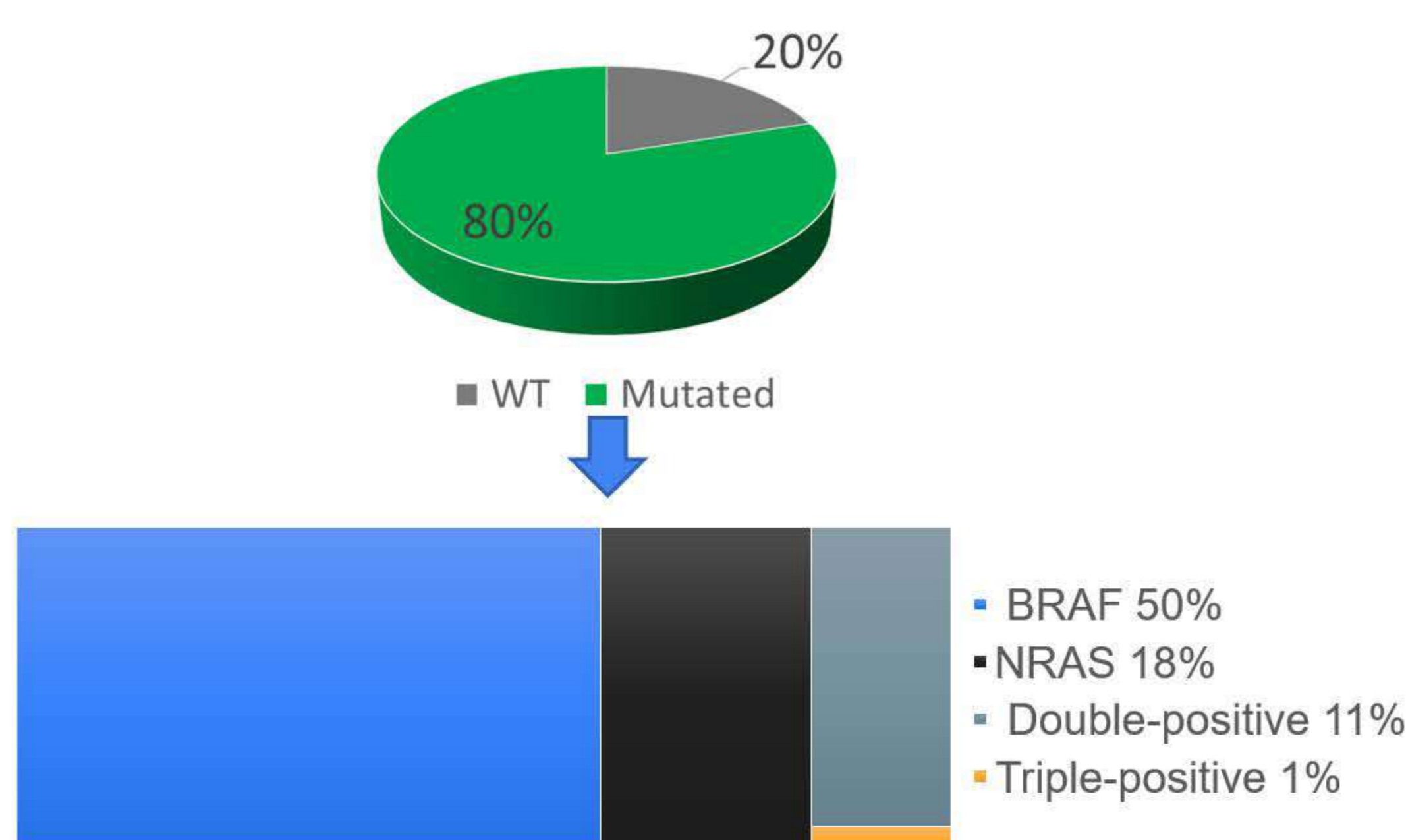


## Materials and Methods

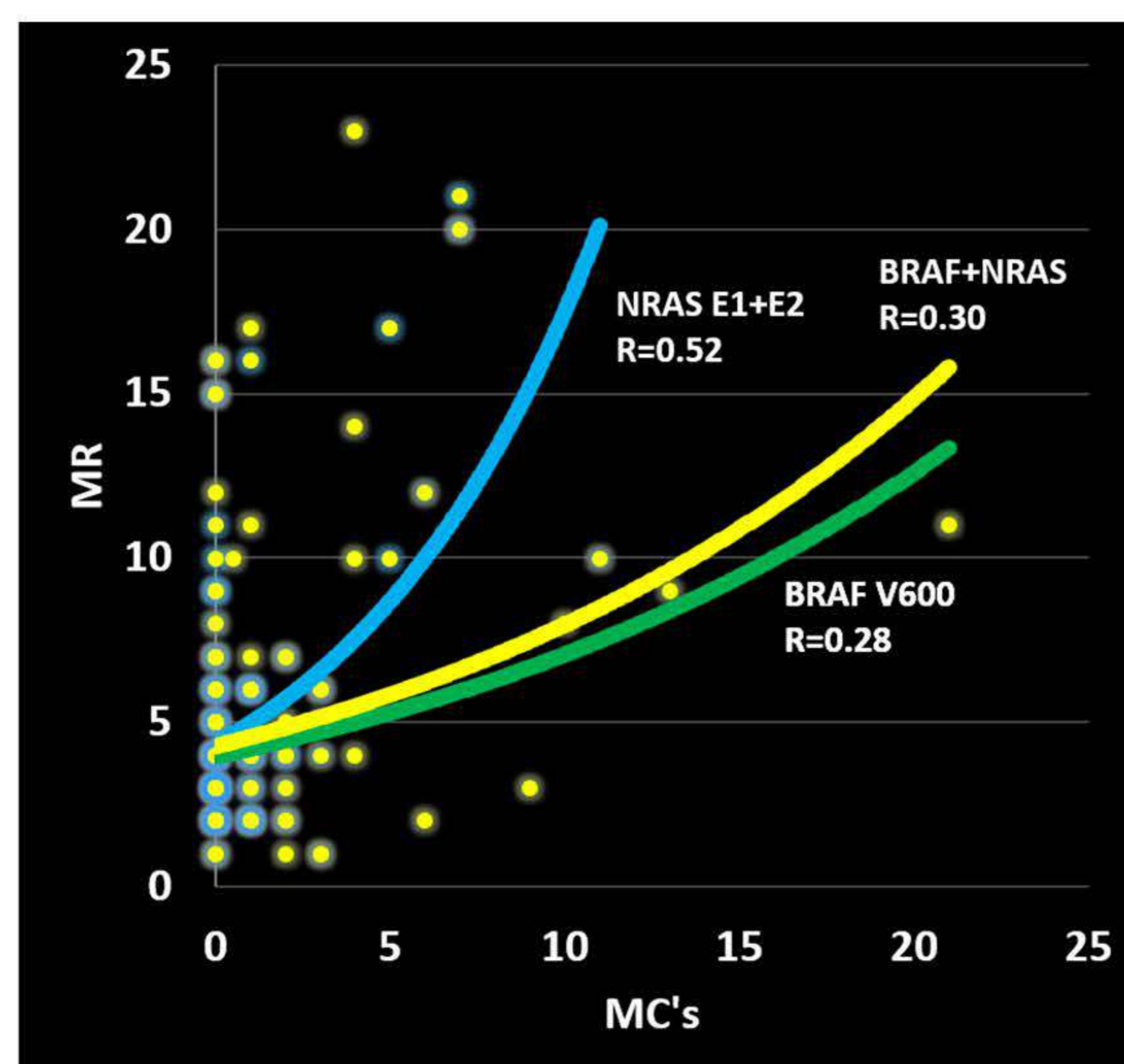
A total of 100 formalin fixed and paraffin embedded CM samples acquired from patients treated in Riga East Clinical University Hospital, Latvian Oncology Center. DNA was extracted using GeneRead™ DNA FFPE kit, Qiagen (Germany). BRAF (V600) and NRAS (G12/13 and Q61) mutations were detected by digital droplet PCR (Bio Rad Laboratories, USA). Histopathological parameters were evaluated on hematoxylin and eosin stained slides.



## Results & Discussion



### MULTINUCLEATED CELL COUNT / MITOTIC RATE CORRELATIONS



Mutations were found in 80% of samples. The majority of mutations were found in BRAF gene (50%). NRAS gene was mutated in 18% of samples, 11% of samples were double positive and one sample was triple positive. Statistically significant correlations were revealed between multinucleated cell count and mitotic rate in samples containing mutations:

BRAF V600 mutations: (R=0.28; 95% CI (0.061-0.464); p=0.012)

NRAS E1 & E2 mutations (R=0.52; 95% CI (0.289-0.695); p=0.0005)

BRAF V600 & NRAS E1; E2 (R=0.30; 95% CI (0.110-0.472); p=0.002)



## Conclusions

BRAF and NRAS mutation prevalence in analyzed Latvian melanoma patients is within margins described in literature.

Correlation exists between multinucleated cell count and mitotic rate in samples containing BRAF and/ or NRAS gene mutations.

This work was supported by the **European Regional Development Fund** project No. 1.1.1/18/A/099 and **“Strengthening of the capacity of doctoral studies at the University of Latvia within the framework of the new doctoral model”** project No. 8.2.2.0/20/1/006



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# Intra-family support to/from the elderly in the Baltic States

Authors: Olga Rajevska, Madara Miķelsone

Riga Stradiņš university



## Introduction

A large part of retirement consumption is derived from sources beyond the formal pension schemes and other public social programs. A fair share of support comes from relatives and friends of the retirees. On the other hand, many pensioners remain socially active and help their estranged relatives, both financially and with practical assistance.



## Research Objective

The study is aimed at understanding how the intra-family support transactions function in the Baltic States against the background of other European countries: who are the donors and the recipients, and what factors contribute to the increased chances to getting or receiving financial and non-financial help.



## Results & Discussion

The research is based on the Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 8 data, collected in 27 countries in 2019-2020. For the analysis, only old-age pensioners from three Baltic States were selected (N= 3,394; including 2,051 from Estonia, 825 from Lithuania and 518 from Latvia). Crude and multivariable binary logistic regression models were used to test for the contribution of different socio-economic factors (gender, age, parenthood status, living single or in couple, and financial situation of respondents) to the probability of receiving and giving support, as well as reciprocity in providing such support.

The great majority of pensioners neither receive or give financial or practical support in all European countries, but respondents in Latvia are considerably less active in participation in the support transactions compared to our Baltic neighbours and most of the other participating countries.




## Conclusions

- Pensioners in the Baltics more often get financial help (Latvia: 6.4%, Lithuania: 9.8%, Estonia: 11.6%) than the European average (6.3%), as well as compared to Denmark (6.1%), Sweden (4.5%), and Finland (5.3%).
- Only pensioners in Estonia more often get practical help (32.9%) than the European average (24.2%), as well as compared to Sweden (23.4%) and Finland (30.3%). For Latvia, proportion of pensioners receiving practical help is 18.8%, and for Lithuania, it is 20.2%.
- For pensioners in Latvia, practical help mainly comes from children (62%), neighbours (9%), and grandchildren (8%); financial gifts mainly come from children (81%), siblings (4%), and other relatives (4%).
- Latvia has the lowest proportion of pensioners giving both financial gifts (5.4%), compared to Lithuania (15%), Estonia (16.7%), Sweden (31%), Finland (36.8%), and Denmark (38.1%), as well as practical help (7.7%), compared to Lithuania (9.9%), Estonia (14.6%), Sweden (34.9%), Finland (38.1%), and Denmark (43%).



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# Challenges of Sustained Economic Growth: Case of the Latvian Economy

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## Introduction

Increasing the openness of European economies, creation of a clean-tech economy, high value jobs, and R&D commercialisation have become a precondition to achieving sustained growth and strong improvements of economic well-being in terms of substantial disparities in macroeconomic performance among Western, Central and Eastern European countries. For countries, especially with small open economies, where the export-to-GDP ratio is rising and respectively the structure of the economy will likewise change as export industries will expand with the growing needs of the global market, effective aggregate demand can become a key factor of increasing business activity and national income. Using annual time series data and given the holistic methodological approach, this research reveals the most significant determinants of the Latvian economy sustained growth.

## Results & Discussion

### Model Estimates

Independent variables	Dependent variable: GDP	t-ratio
Gross fixed capital formation	0.8259*** (0.0017)	3.6819
Foreign direct investment	0.2357 (0.2978)	0.7913
Consumption expenditure	0.6381*** (0.1773)	3.5996
Export	1.0104*** (0.2156)	4.6857
R&D	-21.1291* (12.0644)	-1.7514
Employment	-0.665785 (0.5359)	-1.2423
Energy consumption	0.0535 (0.1775)	0.3017
$R^2$	0.7443	
Adjusted $R^2$	0.6448	
$F(7, 18)$	7.48	
$p$ -value	0.0002	

Notes. \*, \*\*, and \*\*\* denote statistical significance at the 10%, 5% and 1% levels respectively.

The regression model OLS, using observations 1996-2021 (T = 26), is statistically significant. The model results showed that the largest contribution to the dependent variable real GDP growth rate in the Latvian economy is from export, gross fixed capital formation, and consumption expenditure. The research results indicated that the effect of R&D on growth is statistically significant at the 10% significance test level and is negative. It is necessary to take into account this effect also in terms of the economy production possibilities frontier and the law of increasing opportunity cost.

## Conclusions

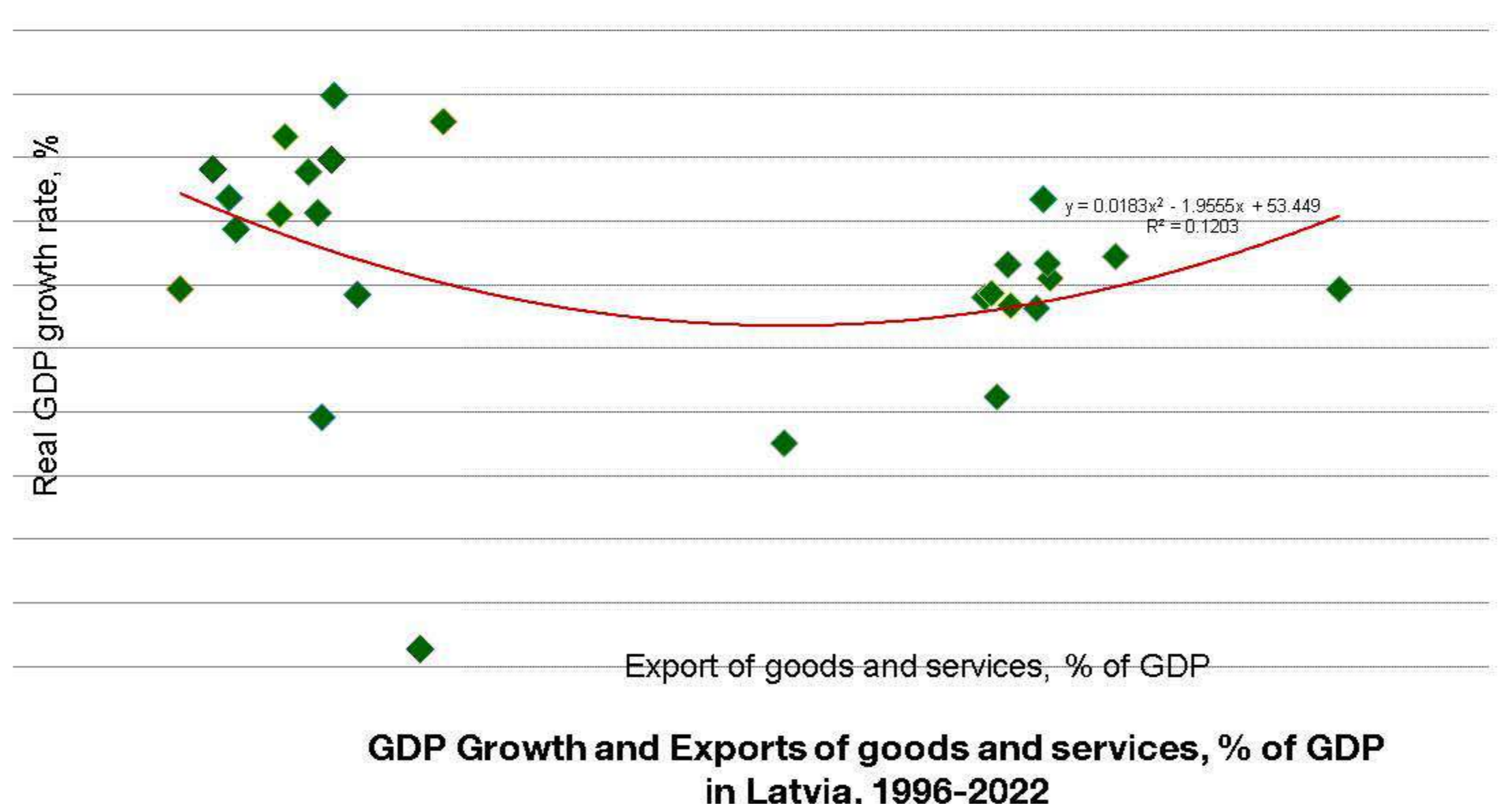
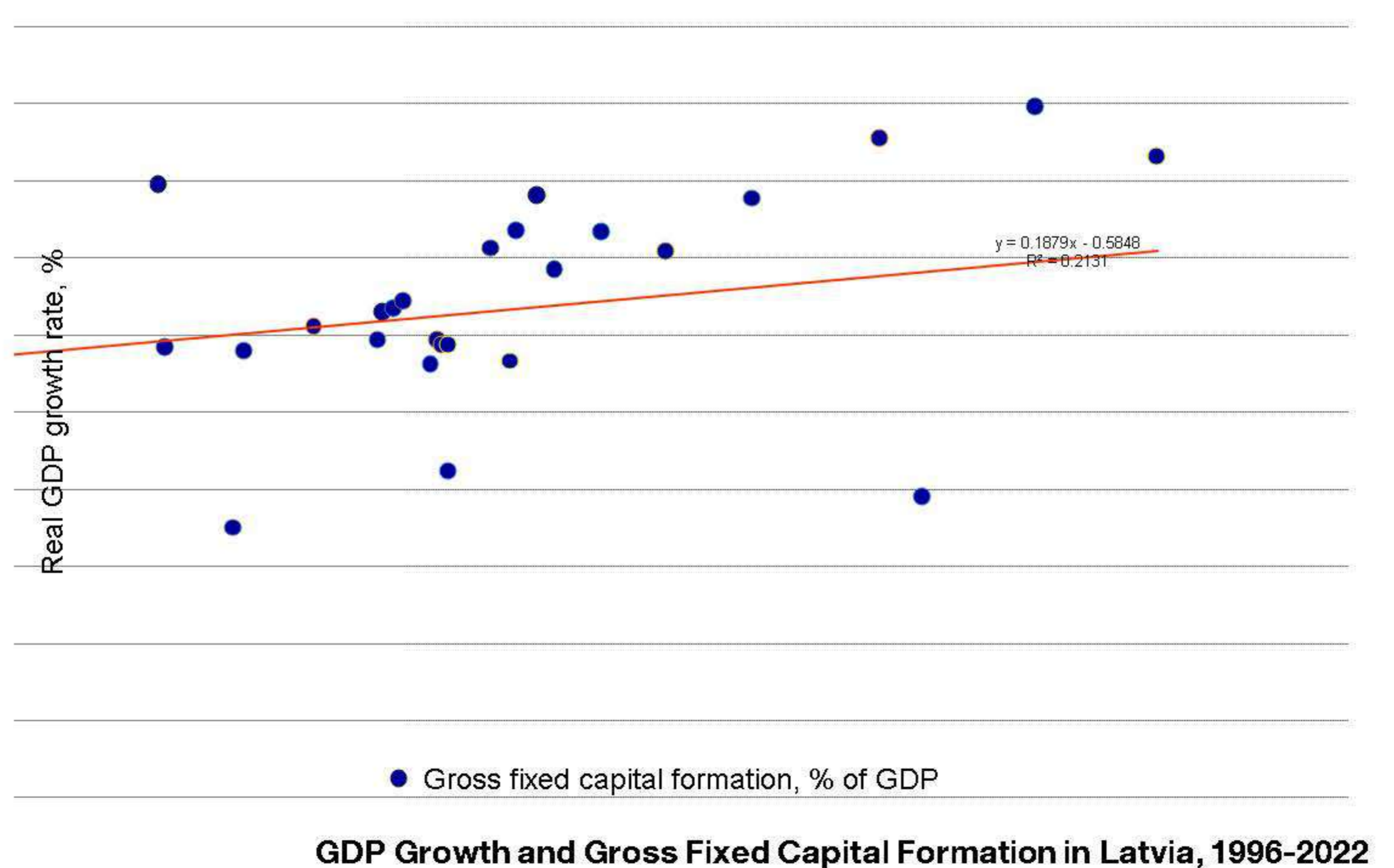
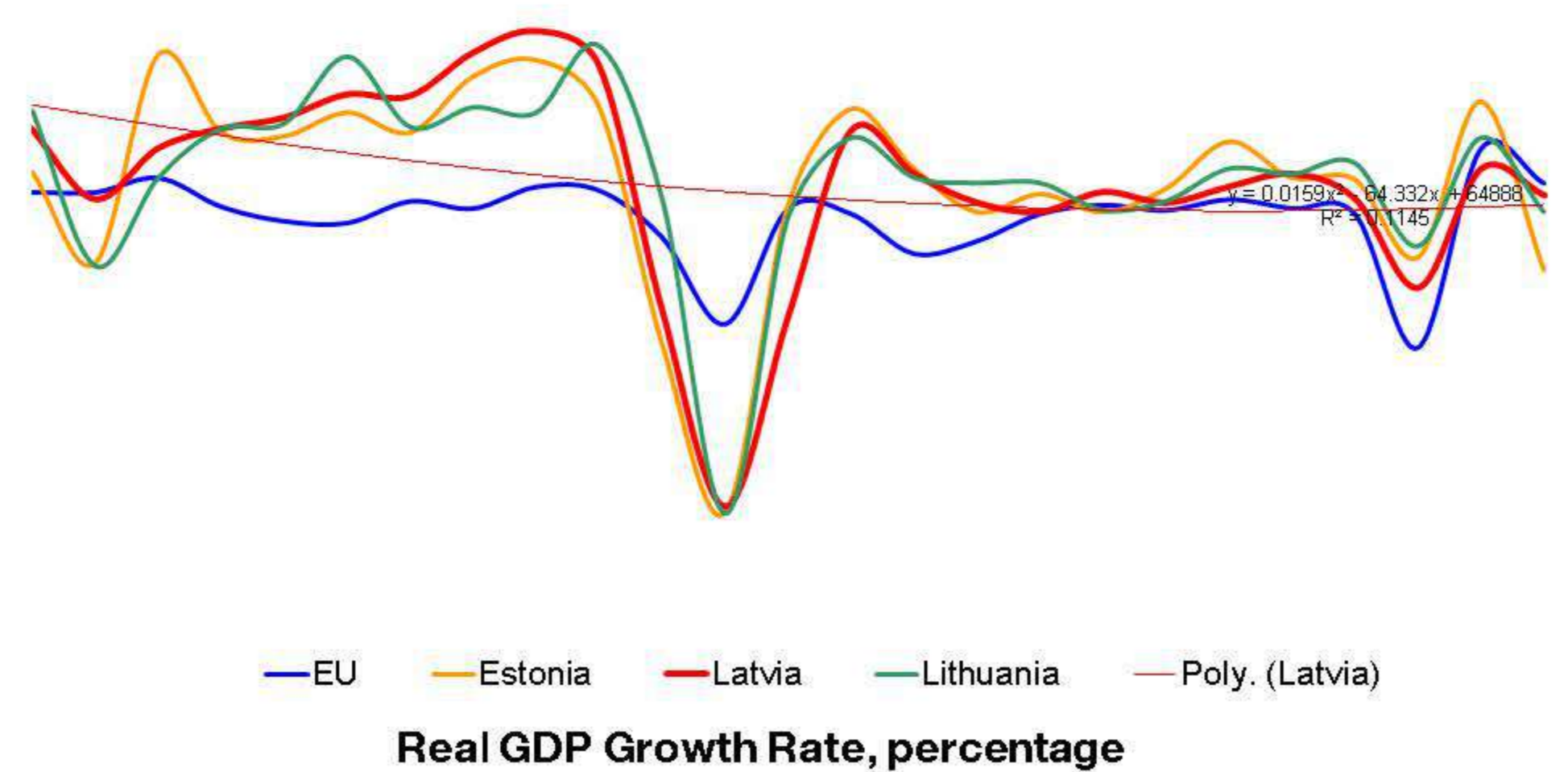
The suggested model empirical estimates specify that foreign direct investment, employment, and energy consumption are statistically insignificant, whereas export, gross fixed capital formation, and consumption have a statistically significant positive effect for the Latvian economy growth. Given its industrial structure, these estimated effects should be considered in macroeconomic adjustment for the Latvian economy sustained growth.

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## Research Objective

This research is aimed at estimating the determinants of economic growth in Latvia, taking into account indicators of inclusion, environmental sustainability, and knowledge-driven development. The empirical study verifies the effects of gross fixed capital formation, foreign direct investment, consumption expenditure, export, R&D, employment, and energy consumption to examine to what extent these determinants can promote economic growth in Latvia.



# Classic Architect Freehand and Digital Drawing

Dr. Arch. Andra Ulme, Mag. Art Elina Elere

Riga Tehnical University Faculty of Architecture

## Introduction

In Latvian science, the topic has also been raised in the context of active research worldwide. The rapid development of digital capabilities and the development of artificial intelligence, including the spread of Covid 19, challenge architects and researchers to pay attention to the process of making tactile, multi-material and sensory mind-affecting (sound and visually perceptible) drawings, and in return to the creation of fast, electronic, possibly task-appropriate tools and their work results: drawings on paper or electronic visualizations. The current situation allows to choose the way of working and visually interpreting your idea (see Fig.1). In the education of young architects, it is possible to try different methods: classical drawing, painting, design thinking, digital image creation using the latest computer software. The role of the architect's hand drawing has been discussed in the literature by Juhani Pallasmaa, Peter Zumthor, Michael Graves, Le Corbusier, Amos Rapoport, Gregor Hohn, Priyanka Shah, Jonathan Glancey and others.

## Research Objective

The main objective is to identify architects' preferences, habits and comfort in using classical and digital drawing for capturing and further developing ideas. To achieve the goal the following tasks were chosen: to conduct a survey among RTU Faculty of Architecture students and Erasmus mobility students, to summarise the results and draw conclusions, to identify existing literature sources.

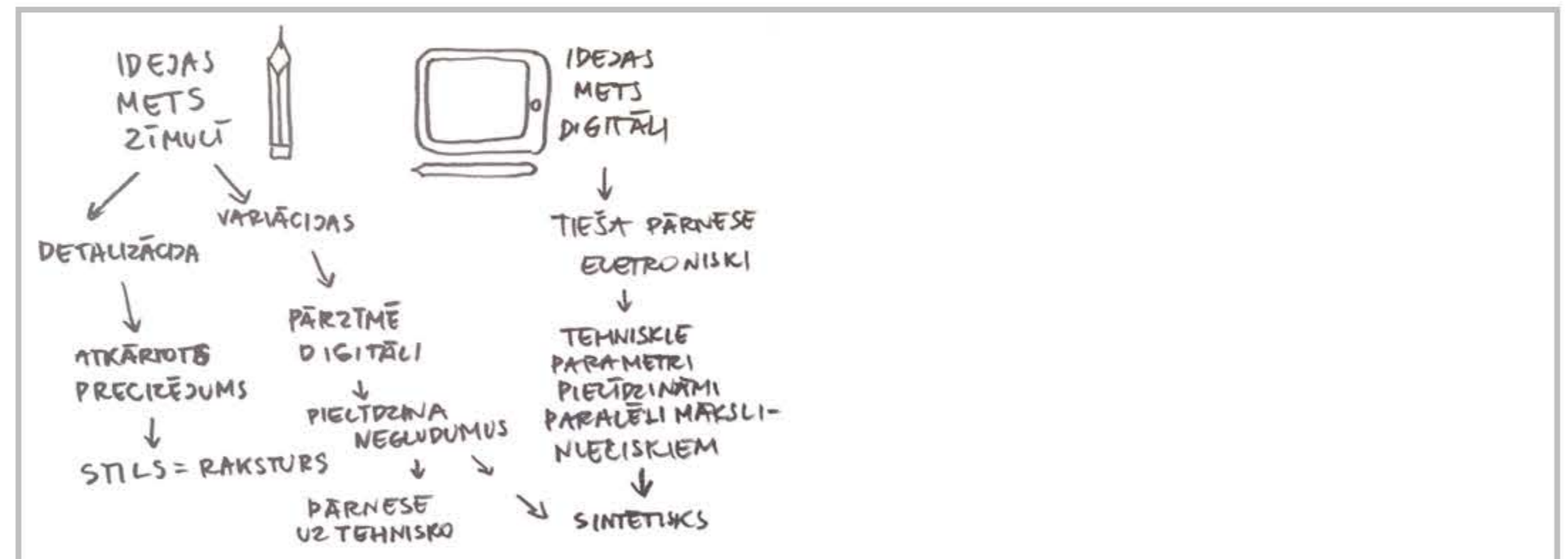


Fig.1 Transfer of an idea into a drawing, schematic representation, latvian language [authored image].

## Results & Discussion

An architect's drawing is a language. Each architect as a personality has his own handwriting. The architect's drawing and range of themes is valuable in the process of exploring the choice of sensory materiality. The object of the drawing research has visual qualities that are embodied in the rhythms, thicknesses and colours of the lines and the architect records them on paper with his free hand, digitally encoded in ArchiCad, Revit, 3DMax, Twinmotion, etc., which allows to develop the creative working process for a precise result. Digitally drawn lines can be reproduced, quickly adapted to spatial simulation, shared with colleagues and those involved in the project, for further development as engineering design, etc. The use of common software in the working environment, working in the cloud, allows different professions to simultaneously carry out activities in the same project and in parallel see the result of the work, developing the different technical and artistic solutions that the project is subject to.

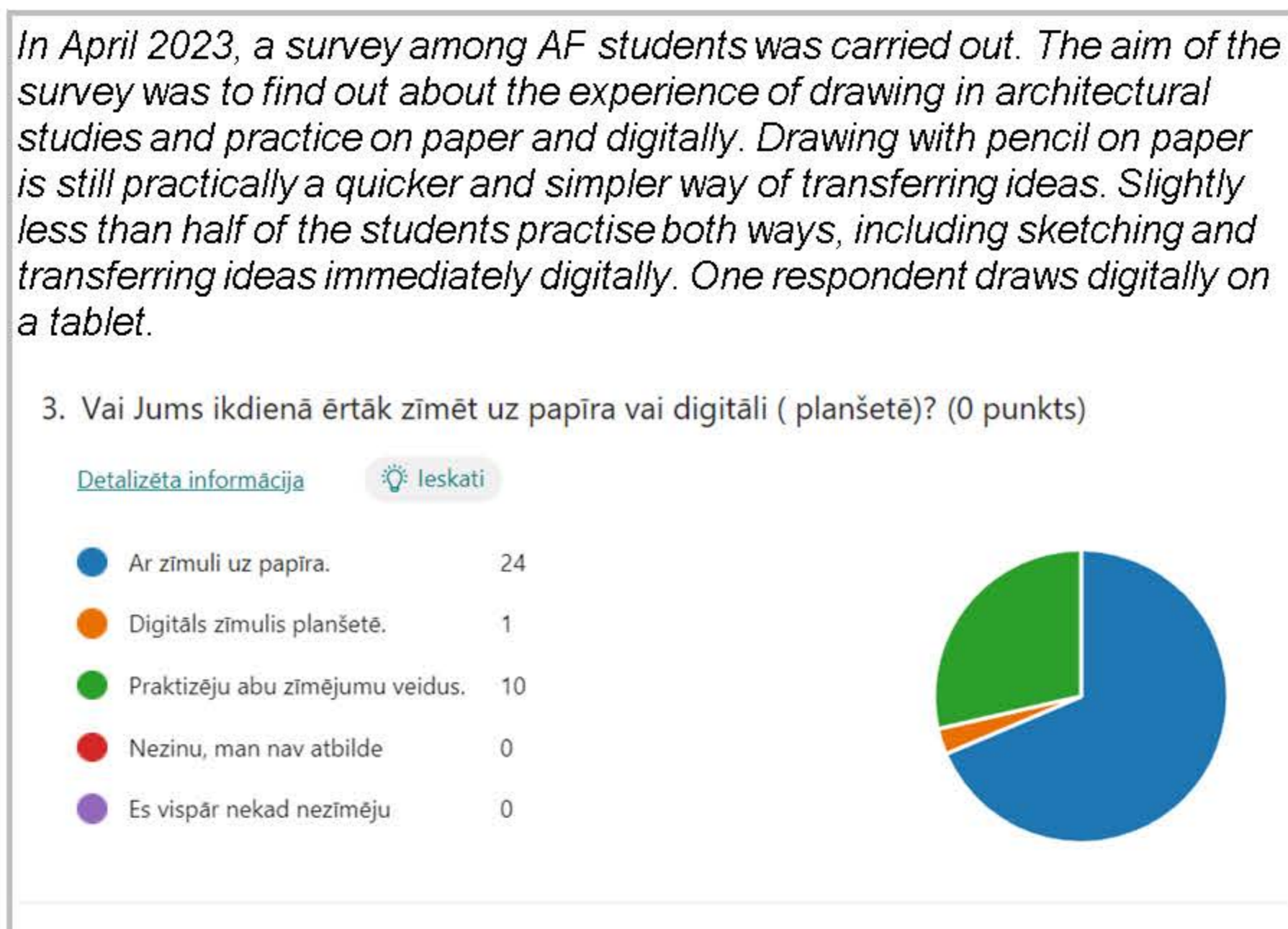


Fig.1.1. Respondents' answers on their habit of drawing digitally or on paper [1].

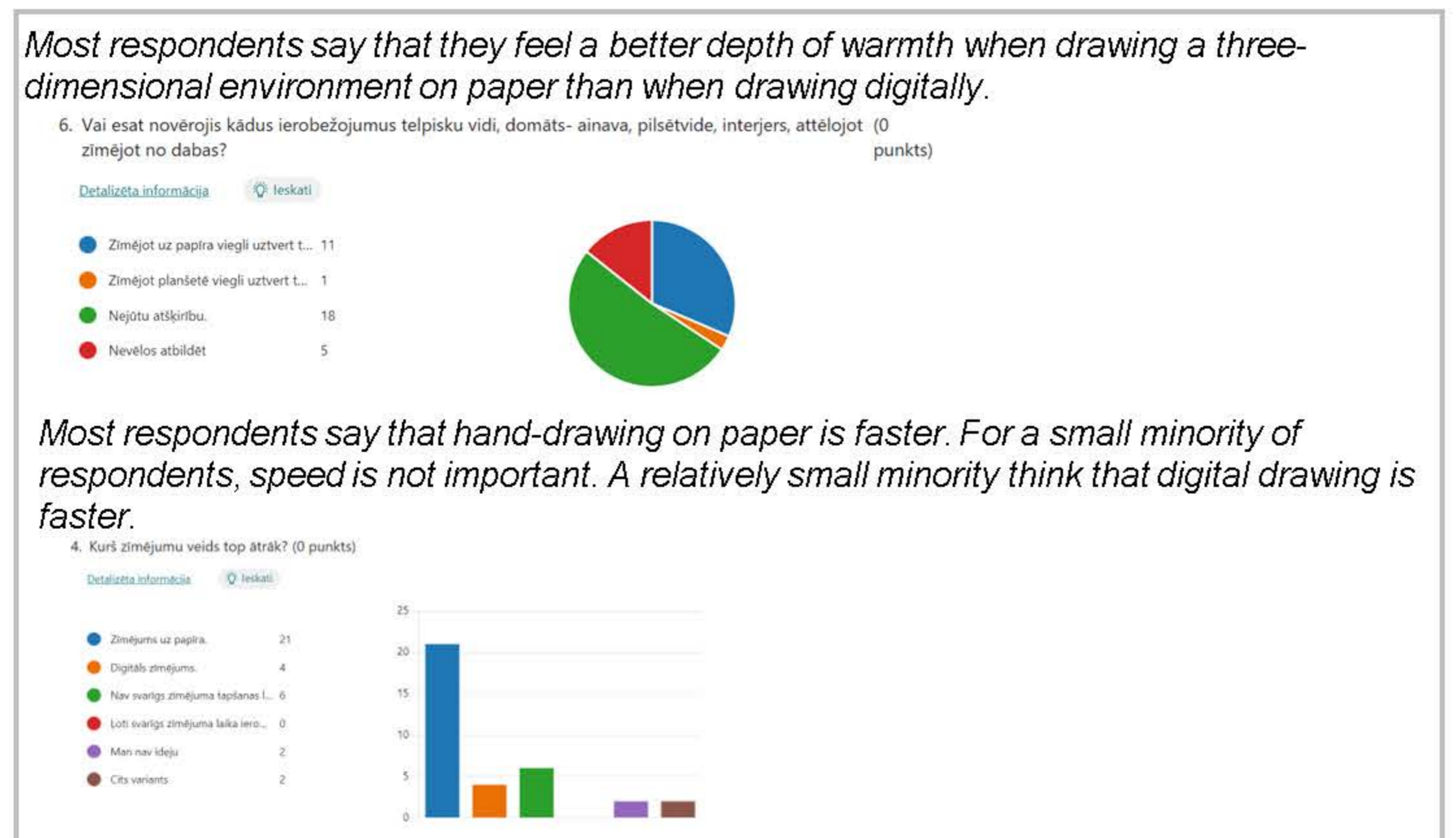


Fig.1.2. Respondents' answers on spatial awareness when drawing on paper and digitally [1].  
Fig.1.3. Respondents' answers to the question about the time spent on drawing [1].

A look at the results of a survey of today's budding architects shows that young people prefer freehand drawing (see Figures 1.1 and 1.2) and recognise it as a faster tool for transferring ideas (see Fig. 1.3). Digital drawings have other advantages and qualities. The literature analysis reviewed 48 resources including scientific articles, current periodicals in the field of architecture and internet resources recognised by professionals worldwide. The authors note that since 2017, a major global architectural hand drawing competition has been established, organised by *Iris Ceramic Group* (UK, *ARCH DAILY*) awarding prizes to authors in three categories: hand drawing, digital drawing and combined/hybrid drawing.

## Conclusions

3D models and visualisations: allows the creation of virtual spatial models that help architects understand the project by virtually walking around and tracing the inside of buildings and the surrounding environment in a 3D simulation. Digital tools allow architects to simulate and analyse different aspects of a building's performance such as energy efficiency, lighting, acoustics and structural integrity. These simulations help architects make informed design decisions, optimise their work and achieve sustainable results. Whether the architect's hand drawing on paper will in future be a museum piece or remain an idea-generating tool and an architect's thought process is a question that is relevant in the age of digital and artificial intelligence. The Architectural Drawing Prize competition and its winners show a new trend where drawing is no longer just a reflection of architectural volumes and environments. Attractive elements from comic book culture are coming in. In this way, the drawing can be traced like a film frame. The new trend engages the viewer, inviting them to read phrases, imagine situations and reflect illusorily. It proposes to distinguish between a hand drawing and a digital or combined one, judging them by their categorisation. On the habits of architecture students: drawing has an independent value as a work of art, an intermediate stage from project idea to developed result. The aim of the research has been fulfilled all the set tasks have been solved.

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# Dažādu Latvijas tumšgalves šķirnes ģenealoģisko līniju meitu piena sastāva analīze

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## Ievads

Latvijas tumšgalve (LT) ir Latvijā selekcionēta vilnas-gaļas tipa aitu šķirne. Tās selekcija vēsturiski ir balstīta uz audzēšanu pa vaislas teķu ģenealoģiskām līnijām. LT šķirnes teķu ģenealoģiskās līnijas: Apolona0302, Edžiņa0365, Feirāma7251, Ikara0121, Irbja0125, Sīgara0005, Sīmaņa0195 un Skara0008, tika apstiprinātas 2014. gadā.

Galvenais aitu audzētāju ienākumu avots ir vaislai vai gaļai realizēts jērs. Tā kvalitāti ietekmē ne tikai pareiza pāru atlase, bet arī aitu mātes piena daudzums un sastāvs zīdīšanas perioda laikā.



1. att. Latvijas tumšgalves šķirnes aitu mātes ar jēriem (a) un sagatavotie piena paraugi (b) (SIA «Mikaitas» foto).

Pētījums par LT šķirnes aitu māšu piena sastāvu veikts SIA Mikaitas, kas atrodas Limbažu novadā (1.att.). Aitu mātes piena paraugu ņemšanas laikā atradās ganībās.

Paraugu ievākšanai mātes līdz vienai stundai atšķīra no jēriem. Piena paraugi (~ 30-45 mL) tika iegūti gan no labās, gan kreisās tesmeņa puses, slaucot ar rokām.

Piena sastāva analīze veikta SIA «Piensaimnieku laboratorija» un paraugos noteikti sekojoši rādītāji: piena tauku saturs (%), proteīna un kazeīna saturs (%), laktozes saturs (%) un somatisko šūnu skaits (SŠS) (tūkst. 1mL piena).



## Rezultāti un diskusija

Ganāmpulka vizuālās apskates laikā tika identificētas aitu mātes ar iespējamu tesmeņa iekaisumu. Piena analīžu rezultāti apstiprināja, ka 10 piena paraugos SŠS pārsniedza miljonu 1 mL piena, tāpēc tālākā rezultātu analīzē izmantoti 40 piena paraugi (1. tab.). Piena paraugu ieguves laikā būtiski jaunākas bija Sīgara0005 līnijas teķu meitas, to raksturo vidējās atnešanās reizes, kas ir 1.2, bet vecākas bija Irbja0125 un Skara0008 līnijas teķu meitas, attiecīgi 4.2 un 4.0 atnešanās reizes (2. tab.).

Piena sastāvs dažādu ģenealoģisko līniju vaislas teķu meitām 12. jūnijā un 19. jūlijā

2. tabula

Aitu māšu tēva ģenealoģiskā līnija	Atnešanās reize	Laktācijas diena	Paraugu paņemšanas datums	Tauku saturs, %	Olbaltumvielu saturs, %	Laktozes saturs, %	SŠS, tūkstoši 1 ml piena
Edžiņš0365	2.3±0.25 <sup>b</sup>	59±1.0 <sup>a</sup>	12.06.	5.89±0.31 <sup>Aa</sup>	4.80±0.17 <sup>Ab</sup>	4.46±0.25 <sup>Aa</sup>	134.7±27.90 <sup>Ab</sup>
		96±1.0	19.07.	4.14±0.38 <sup>B</sup>	6.40±0.06 <sup>Ba</sup>	4.90±0.05 <sup>Bb</sup>	63.1±12.59 <sup>Ba</sup>
Irbis0125	4.2±0.91 <sup>c</sup>	59±2.2 <sup>a</sup>	12.06.	6.36±0.34 <sup>Aab</sup>	4.71±0.13 <sup>Ab</sup>	4.93±0.04 <sup>Ab</sup>	84.9±6.61 <sup>Aa</sup>
		96±2.2	19.07.	4.93±0.56 <sup>B</sup>	5.66±0.15 <sup>Bb</sup>	4.70±0.05 <sup>Ba</sup>	111.3±31.48 <sup>Aab</sup>
Skaris0008	4.0±1.08 <sup>c</sup>	62±1.9 <sup>ab</sup>	12.06.	7.09±0.38 <sup>Ab</sup>	5.34±0.03 <sup>Aa</sup>	4.91±0.05 <sup>Ab</sup>	94.4±14.25 <sup>Aa</sup>
		99±1.9	19.07.	4.72±0.52 <sup>B</sup>	6.46±0.06 <sup>Ba</sup>	4.79±0.04 <sup>Ba</sup>	63.1±9.93 <sup>Ba</sup>
Sīgars0005	1.2±0.20 <sup>a</sup>	67±2.9 <sup>b</sup>	12.06.	6.54±0.55 <sup>Aab</sup>	4.89±0.09 <sup>Aab</sup>	4.67±0.10 <sup>Aa</sup>	163.5±38.71 <sup>Ab</sup>
		104±2.9	19.07.	4.78±0.53 <sup>B</sup>	6.30±0.07 <sup>Ba</sup>	4.83±0.07 <sup>Aab</sup>	74.8±19.11 <sup>Ba</sup>
Apolons0302	2.0±0.00 <sup>b</sup>	63±5.0 <sup>ab</sup>	12.06.	7.52±0.89 <sup>Ab</sup>	5.11±0.28 <sup>Aab</sup>	4.72±0.11 <sup>Aa</sup>	198.0±35.36 <sup>Ab</sup>
		100±5.0	19.07.	4.81±1.30 <sup>B</sup>	6.54±0.17 <sup>Ba</sup>	4.85±0.15 <sup>Aab</sup>	84.0±28.21 <sup>Ba</sup>

A, B – būtiski atšķirīgs piena sastāvs vienas ģenealoģiskās grupas aitu mātēm dažādos piena paraugu ņemšanas laikos, p<0.05

a, b, c - būtiski atšķirīgs atnešanās reizu skaits un piena sastāvs vienā paraugu ņemšanas laikā dažādu ģenealoģisko līniju teķu meitām, p<0.05

Palielinoties laktācijas dienai, visu ģenealoģisko līniju teķu meitu pienā būtiski izmainījās tauku un olbaltumvielu saturs, tauku saturs samazinājās, bet olbaltumvielu saturs palielinājās. Stabīlākais ir laktozes saturs pienā, kas bija robežās no 4.46% Edžiņa0365 līnijas meitām līdz 4.93% Irbja0125 līnijas teķu meitām. Mazākais SŠS pienā 2. laktācijas mēnesī iegūts Irbja0125 līnijas teķu meitu pienā (84.5 tūkst. 1 mL), bet trešajā laktācijas mēnesī Edžiņa0365 un Skara0008 līniju teķu meitām, vidēji 63.1 tūkst. 1 mL piena.

- Apolona0302 un Skara0008 līnijas teķu meitu piens otrajā laktācijas mēnesī saturēja vairāk sausas, attiecīgi 17.35% un 17.34%, kas trešajā laktācijas mēnesī samazinājās līdz 16.20% un 15.97%.
- Zemāks SŠS otrajā un trešajā laktācijas mēnesī bija Skara0008 līnijas teķu meitu pienā, attiecīgi 94.4 un 63.1 tūkst. 1mL.

## Secinājumi

## Kontaktinformācija Anda Valdovska, Dr.med.vet., e-mail: anda.valdovska@lbtu.lv

## Īevads

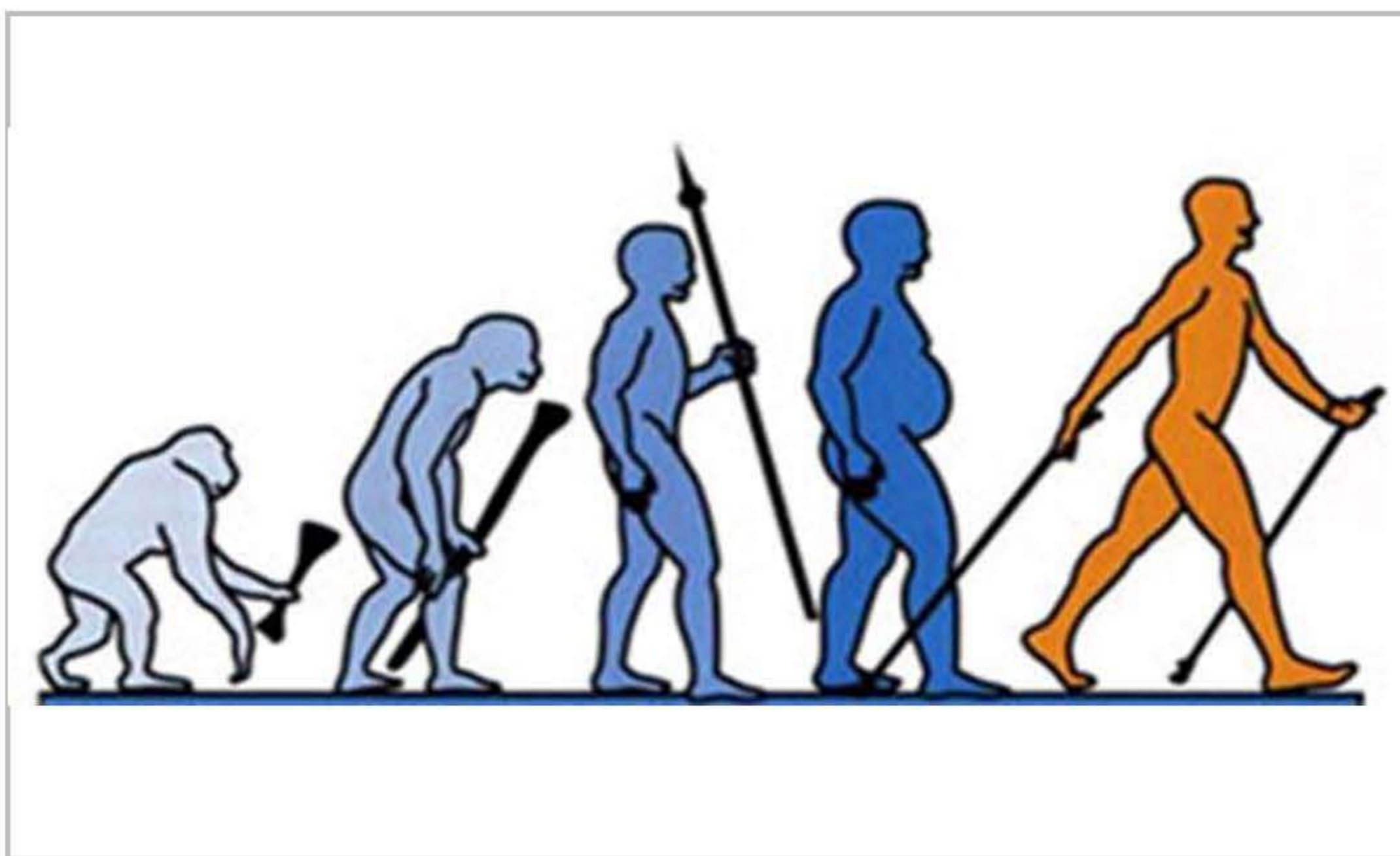
« Nordic walking (turpmāk tekstā- NW) ir sevišķi draudzīgs cilvēku veselībai fizisko aktivitāšu veids. NW dzimtene Somija. Unikāls fiziskās aktivitātes veids studējošajai jaunatnei. Piemērots neatkarīgi no: dzimuma, fiziskās sagatavotības, relatīvi viegli apgūstams. NW tehniku apgūvušajiem tiek nodarbināta lielākā daļa (90%) ķermeņa muskulatūras. Būtiski meklēt fiziskās aktivitātes, kas būtu sabiedrībā populāras, mazāk simptomus izraisošas un līdz ar to stimulētu cilvēku iesaistīties tajās.

## Pētījuma mērķis

« Mērķis noskaidrot studentu izvēles motivējošos aspektus nodarboties ar nūjošanu (NW) Covid-19 laikā un pēc pandēmijas.



## Rezultāti un diskusija



« Pētījuma metodes. Intervija un rezultātu kontentanalīze. 2020./2021 un 2022./2023. studiju gada laikā. Pētījuma dalībnieki 120 RSU studenti, kuri izvēlējušies nodarboties ar NW. Studenti, izvēloties un nodarbojoties ar NW, kā svarīgāko aspektu, piemin "sevis un profesionālās pilnveides iespēja", "praksē apgūt NW tehniku", "aktīvi pavadīt laiku svaigā gaisā", "uzlabot garastāvokli", "gūt pozitīvas emocijas", "labu pašsajūtu". Pēc Covid-19 "interese par šo fizisko aktivitāti", "palielināt fiziskās aktivitātes līmeni", «attīstīt biomotorās spējas» Studentu atbildes liecina, ka NW uzlabo fizisko un psihoemocionālo labsajūtu. Pēc Covid tiek akcentēts "uzlabojies miegs", mazinājusies trauksmainība un nervozitāte. NW fiziskā aktivitāte, unikāla ar to pieejamību un iespēju uzturēt un motivēt sevi būt labā fiziskā formā Covid-19 laikā un pēc, "lauzts stereotips par nūjošanu, kā veco ļaužu aktivitāti". Būtiskas atšķirības motivējošo atziņu izvērtēšanā Covid-19 pandēmijas laikā, un pēc nav vērojamas.

## Secinājumi

« RSU studentu motivāciju nodarboties ar NW ietekmēja vēlme apgūt jaunu fizisko aktivitāti, uzlabojot fizisko un psihoemocionālo pašsajūtu, gūto zināšanu un prasmju izmantošanu Latvijas sabiedrības labā. Studenti atzinuši, ka NW - fiziskās aktivitātes veids ir piemērots studējošajai jaunatnei, fiziskās slodzes intensitāti ir iespējams viegli variēt atbilstoši pašsajūtai, fiziskajai sagatavotībai un NW notiek ārpus telpām «dabas sporta zālē».

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# Prevalence and genetic diversity of *Listeria monocytogenes* in cattle farm environment in Latvia

Žanete Šteingolde<sup>1,2</sup>, Margarita Terentjeva<sup>1,2</sup>, Juris Ķibilds<sup>1</sup>, Irēna Meisterē<sup>1</sup>, Jeļena Avsejenko<sup>1</sup>, Madara Streikiša<sup>1</sup>, Silva Gradovska<sup>1</sup>, Laura Alksne<sup>1</sup>, Aivars Bērziņš<sup>1,2</sup>

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<sup>2</sup> Latvia University of Life Sciences and Technologies, Faculty of Veterinary Medicine

## Introduction

*Listeria monocytogenes* is ubiquitously distributed in the environment. *L. monocytogenes* is a zoonotic pathogen and can cause disease called listeriosis in humans and animals. Farm ruminants are considered as reservoir of *L. monocytogenes* and they can shed the pathogen in the farm environment, thus possessing the risk of listeria to enter the food production chain and cause a potential health risk to humans (Fig. 1).

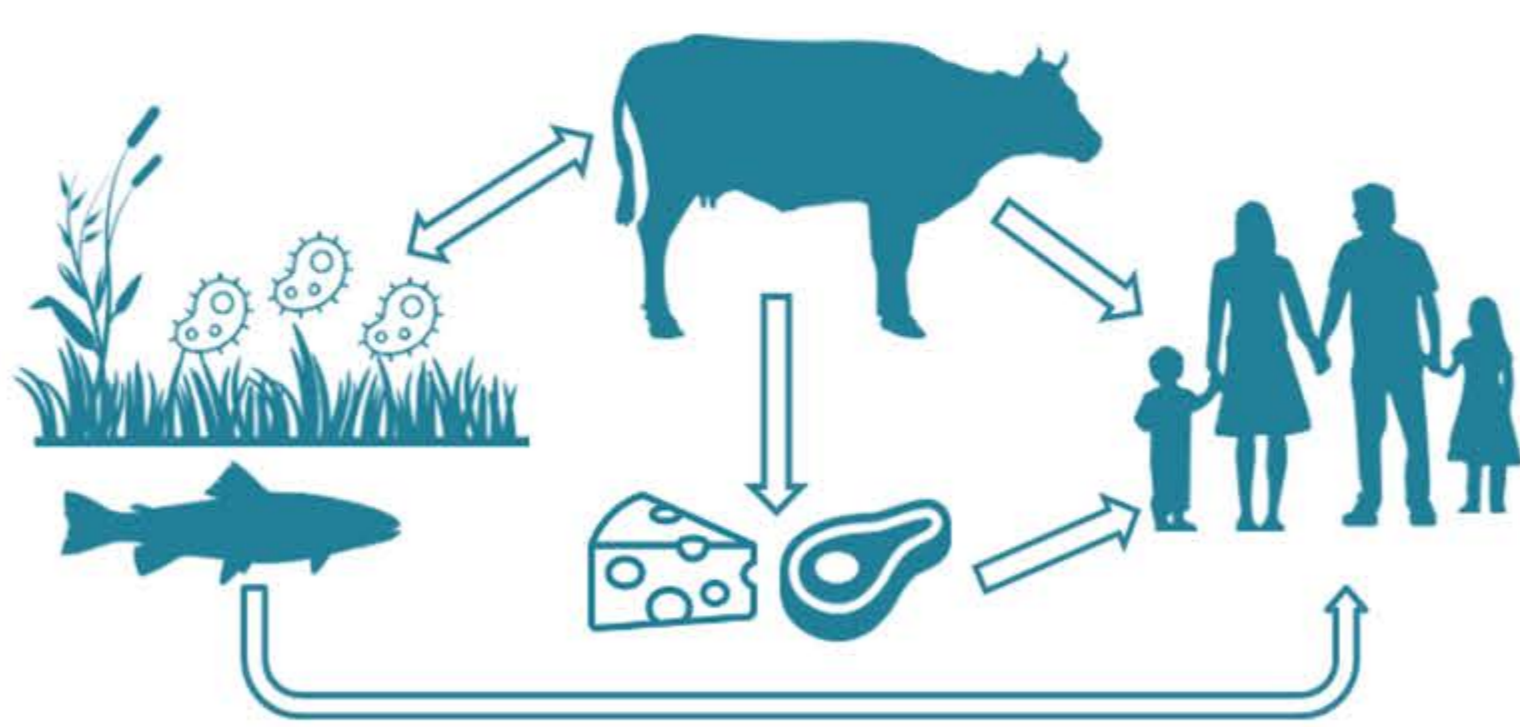


Figure 1. The routes of distribution and infection with *L. monocytogenes*.

## Research Objective

The aim of this study was to detect the prevalence of *L. monocytogenes* in cattle farm environment and to determine the genetic diversity, including the virulence genes of *L. monocytogenes*. In total, 521 environmental samples (Fig. 2) from 27 cattle farms were investigated and whole genome sequencing (WGS) was used for genetic analyses of *L. monocytogenes* isolates.

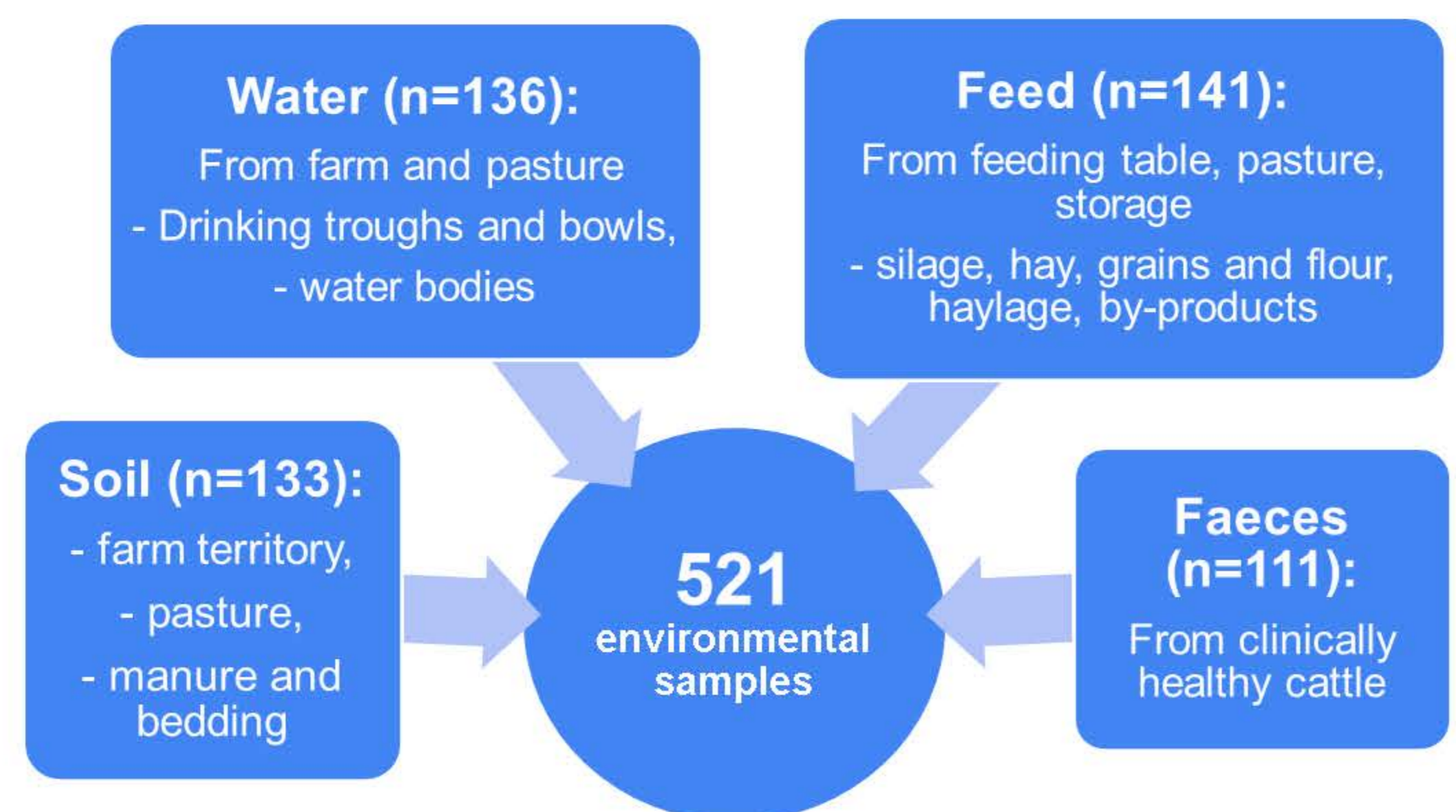


Figure 2. Environmental sample types that were included in the study.

## Results & Discussion

In total, *L. monocytogenes* were observed in 19% of environmental samples in cattle farms. The highest prevalence was found in faeces – 25.2%, but the lowest in the feed samples – 14.9% (Fig. 3). The majority of *L. monocytogenes* isolated belonged to serogroup IIa, but two isolates were of IVb and one isolate of IIc serogroup. Fifteen different sequence types (ST) and clonal complexes (CC) were detected. The most prevalent were ST37/CC37 (30%), ST451/CC11 (20%) and ST18/CC18 (17%) (Fig. 4). We analysed 41 virulence genes. The key virulence genes like *inlA*, *inlB*, *inlC*, *prfA*, *plcA*, *hly* were observed in all analysed isolates. Virulence genes encoding listeriolysin S were observed only in ST4/CC4, serogroup IVb, isolated from faeces. Between the isolates limited to one farm, up to six different STs/CCs were observed. Overall seven *L. monocytogenes* clusters were identified between the studied isolates (Fig. 5).

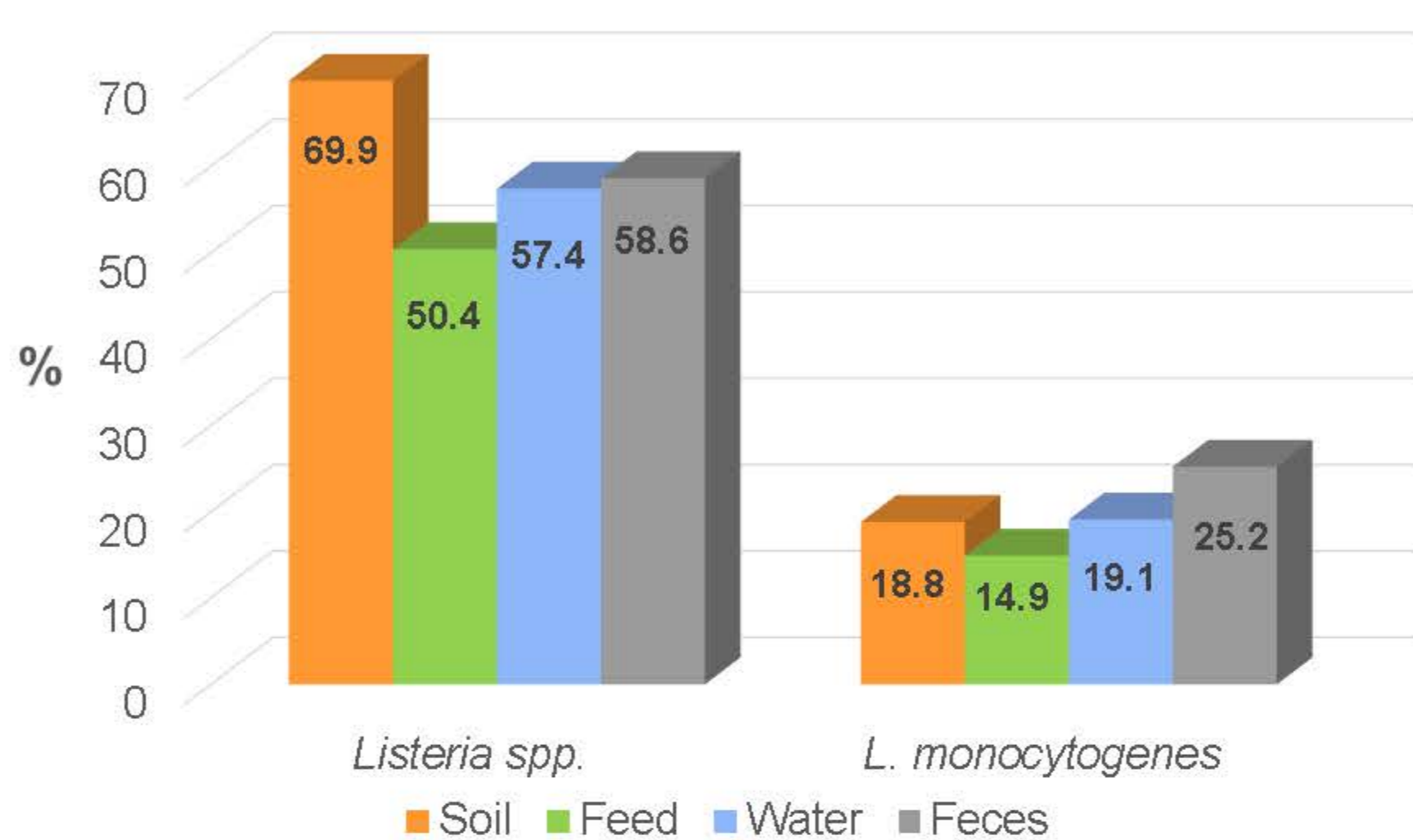


Figure 3. Prevalence of *Listeria* spp. and *L. monocytogenes* in the environmental samples

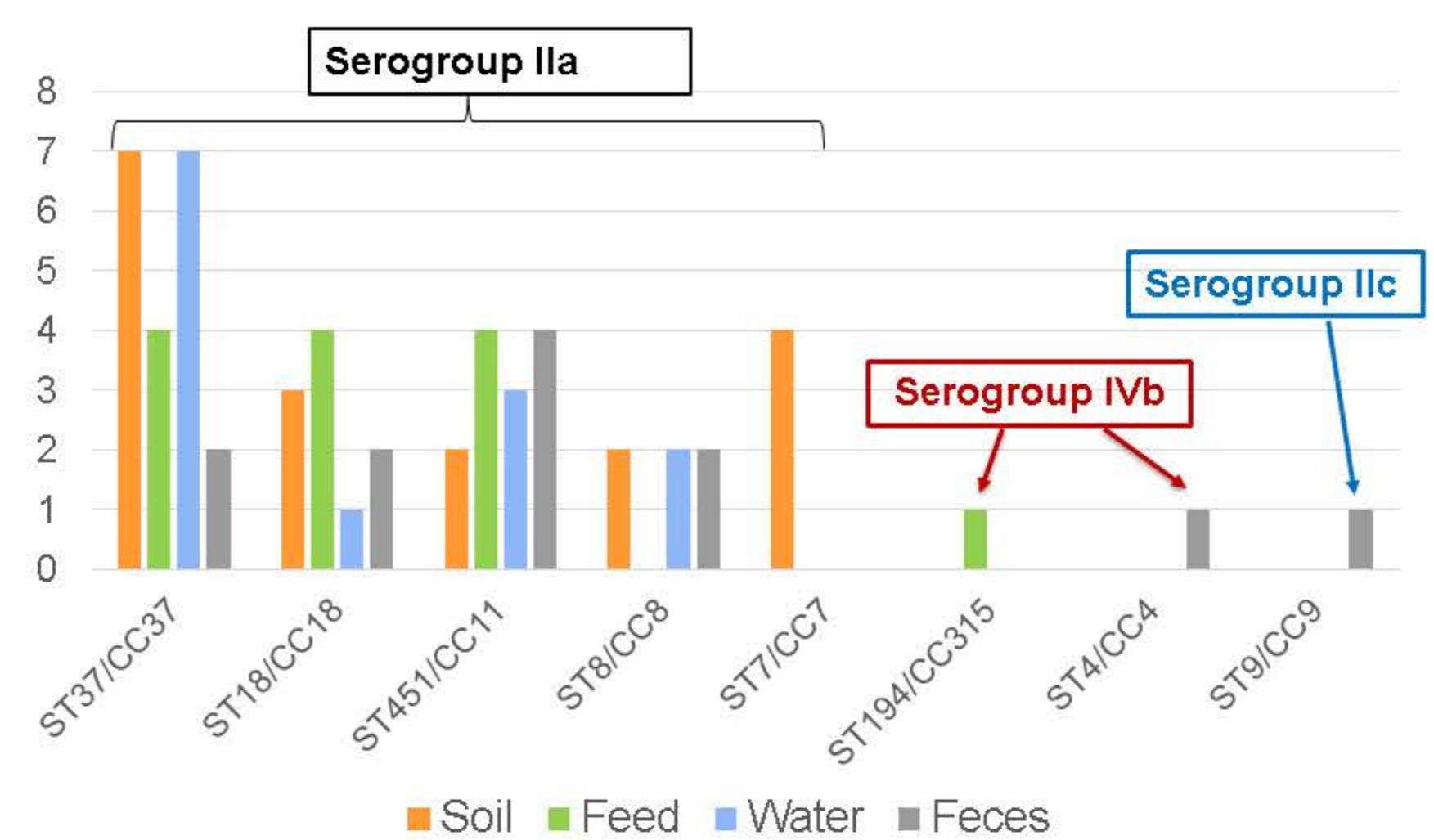


Figure 4. Most prevalent ST and CC among environmental samples.

## Conclusions

- In the cattle farm environment *L. monocytogenes* were widely distributed and demonstrated broad genetic diversity;
- Hypervirulent strains of serogroup IVb were present in the cattle farms;
- Identification of *L. monocytogenes* clusters indicated active circulation of the pathogen in the cattle farms.

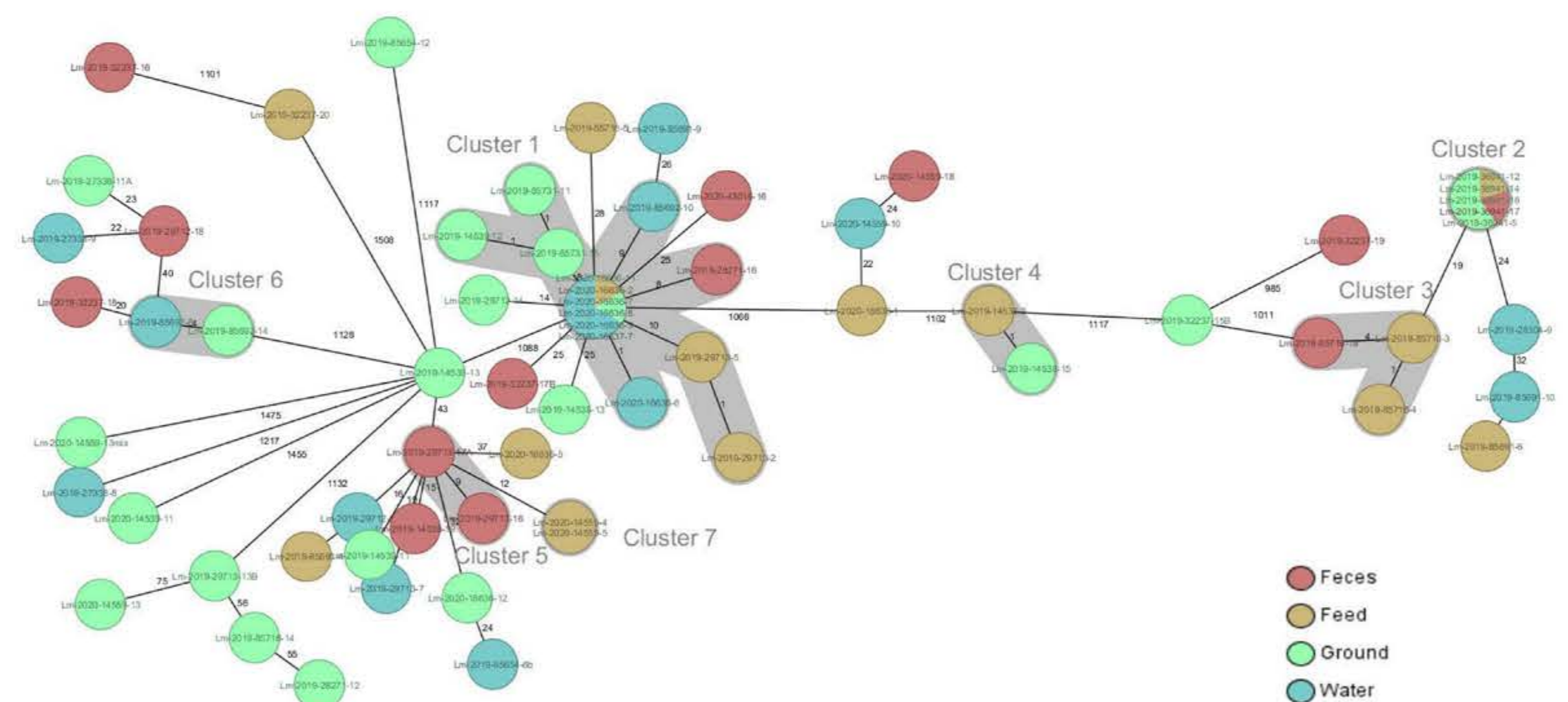


Figure 5. Ridom SeqSphere + Minimum spanning tree. Comparison of *L. monocytogenes* environmental isolates

## Contact Information

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# Kartupeļu šķirnes ar paaugstinātu slāpekļa izmantošanas efektivitāti videi draudzīgai lauksaimniecībai

Inese Taškova, Ilze Skrabule, Ilze Dimante

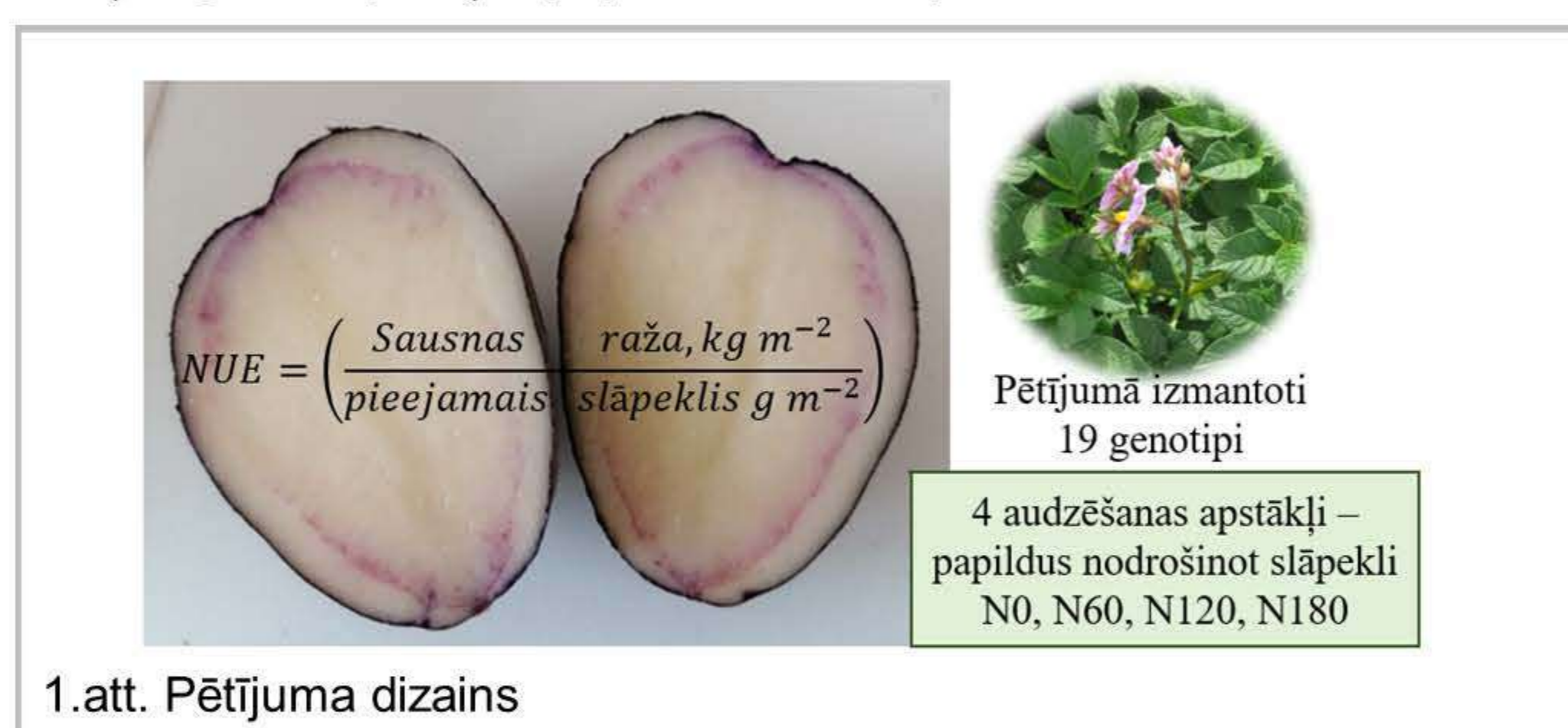
Agroresursu un ekonomikas institūts

## Īvads

Kartupeļi (*Solanum tuberosum* L.) ir viens no svarīgākajiem un plašāk audzētajiem kultūraugiem pasaulē, kurš nodrošina iedzīvotājus ar enerģiju un veselībai nozīmīgām uzturvielām. Savukārt, viens no svarīgākajiem augstu kartupeļu ražu nodrošinošiem barības elementiem augsnē ir slāpeklis, bet pārmērīga tā mēslošanas līdzekļu lietošana rada apkārtējās vides piesārņojuma risku. Tā kā kartupeļi izmanto tikai daļu augsnē pieejamā slāpekļa, tad slāpekļa mēslojuma ietekmi uz vidi par mazināt, audzējot kartupeļu šķirnes ar paaugstinātu slāpekļa izmantošanas efektivitāti.

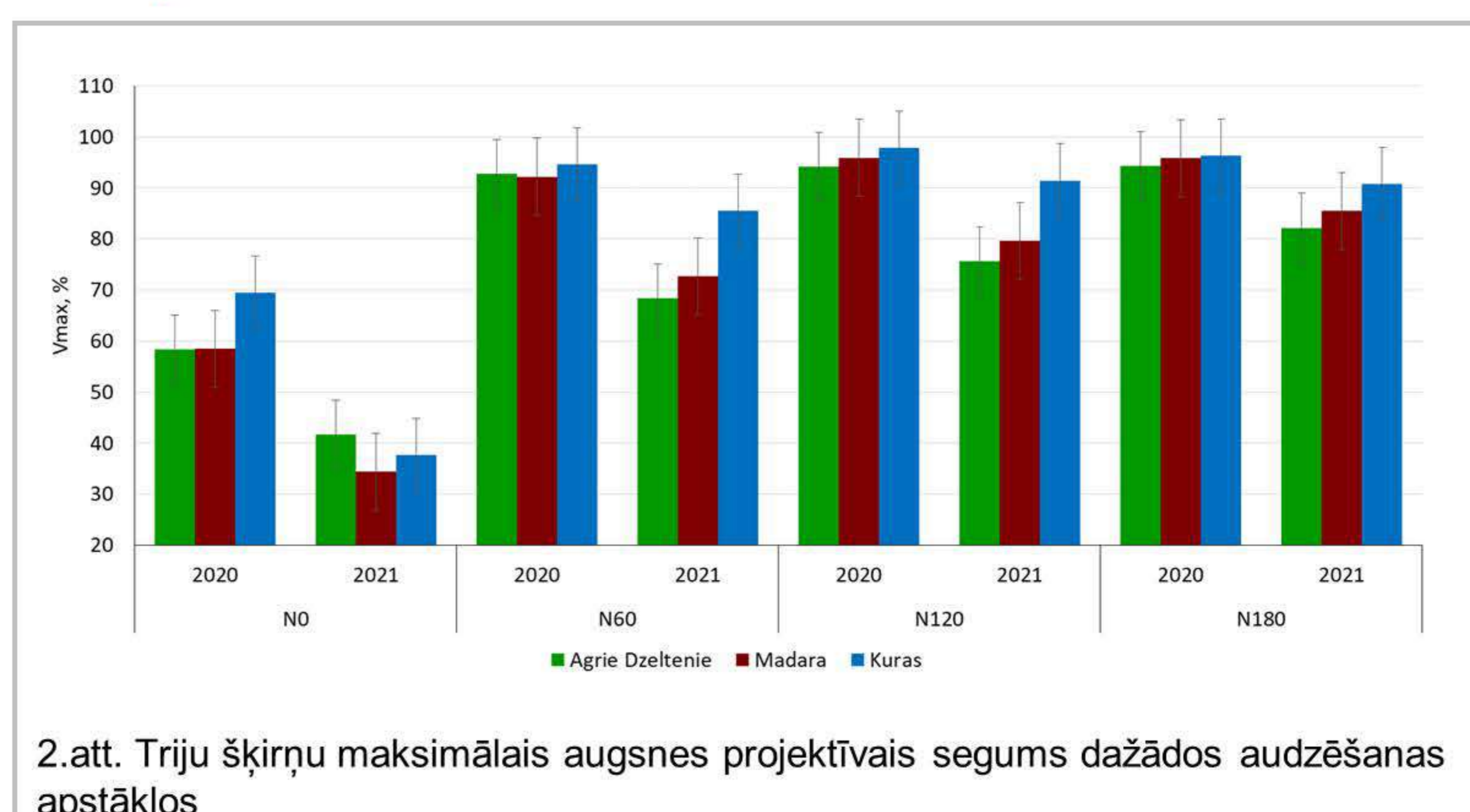
## Pētījuma mērķis

Pētījuma mērķis bija izvērtēt sakarības starp kartupeļu genotipu maksimālo lapotnes augsnes projektīvo segumu ( $V_{max}$ , %) un slāpekļa izmantošanas efektivitāti (NUE) dažādos audzēšanas apstākļos ar atšķirīgu slāpekļa (N) nodrošinājumu.

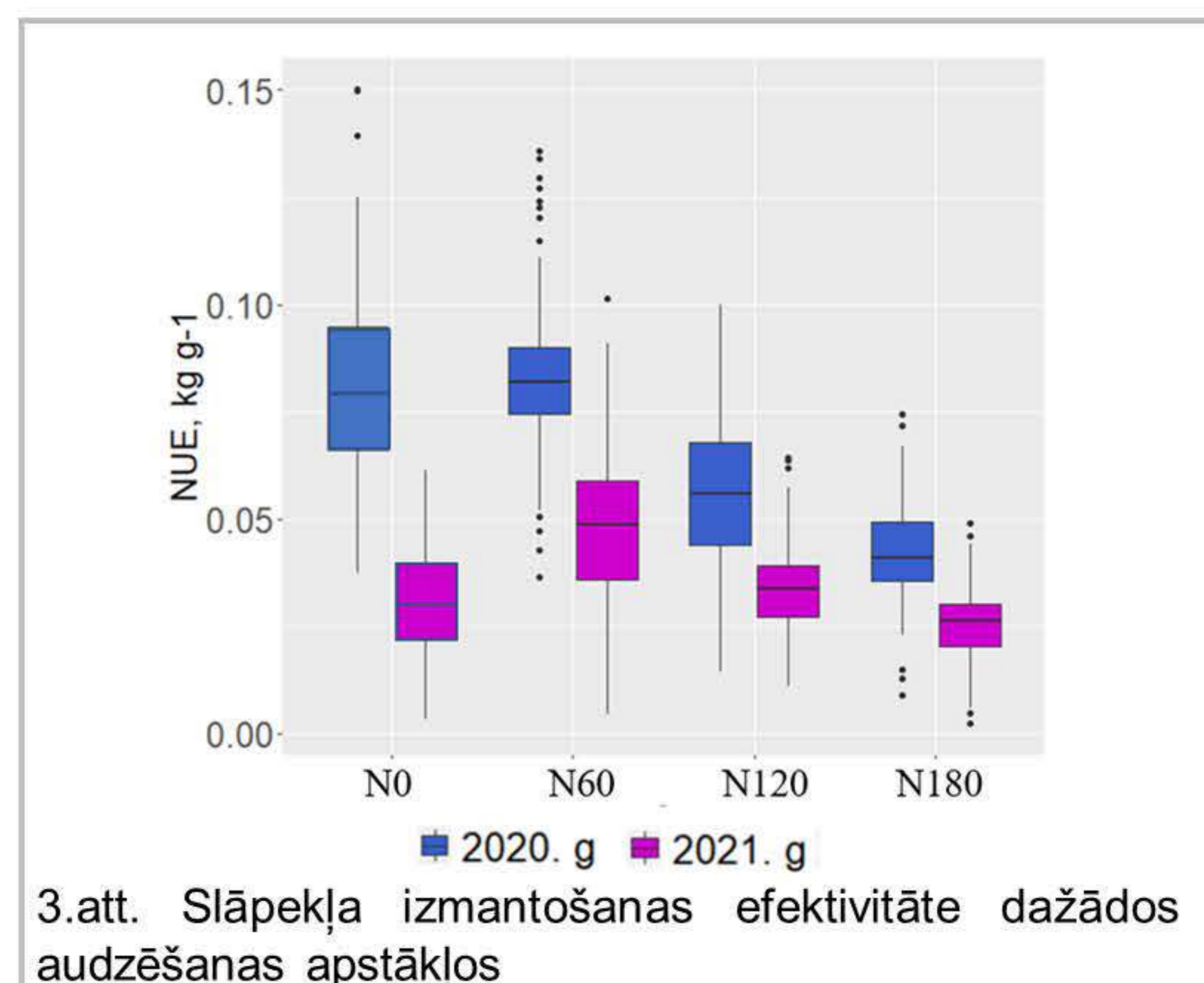


1.att. Pētījuma dizains

## Rezultāti un diskusija



2.att. Triju šķirņu maksimālais augsnes projektīvais segums dažādos audzēšanas apstākļos



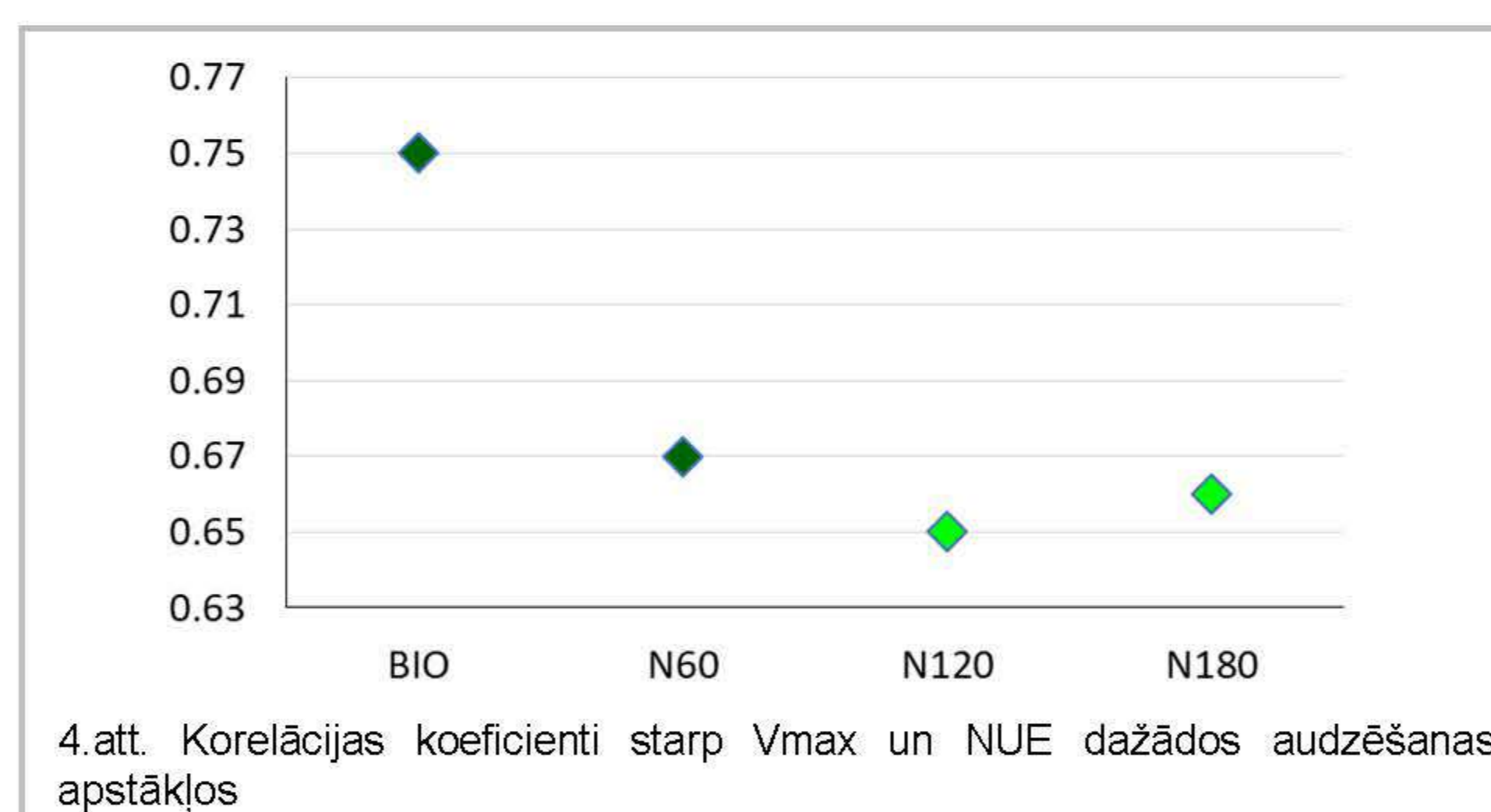
3.att. Slāpekļa izmantošanas efektivitāte dažādos audzēšanas apstākļos

Slāpekļa izmantošanas efektivitāti un maksimālo lapotnes augsnes projektīvo segumu būtiski ietekmēja genotips, audzēšanas apstākļi un veģetācijas periods. Šķirnes ar augstāko NUE bija 'Kuras', 'Jogla' un 'Magdalena' visos audzēšanas apstākļos. Genotipi ar augstāko  $V_{max}$  pie N0 nodrošinājuma bija 'Monta', selekcijas klons S033067-33 un 'Lenora', bet apstākļos ar N60, N120 un N180 nodrošinājumu – 'Rigonda', 'Kuras' un selekcijas klons S033067-33. Vidēji augstākais NUE bija audzēšanas apstākļos N0, bet tas samazinājās, palielinoties N nodrošinājumam augsnē. Savukārt, vidēji augstākais  $V_{max}$  bija audzēšanas apstākļos ar N120. Visos audzēšanas apstākļos 2020. gadā  $V_{max}$  un NUE vērtības bija augstākas nekā 2021. gadā, kad sausums negatīvi ietekmēja pētāmās pazīmes.

Konstatēts, ka starp  $V_{max}$  un NUE ir ciešas pozitīvas korelācijas audzēšanas apstākļos ar N0 un N60 nodrošinājumu, bet vidēji ciešas apstākļos ar N120 un N180 nodrošinājumu.

## Secinājumi

Kartupeļu ceru maksimālo lapotnes augsnes projektīvo segumu procentos var izmantot, lai netieši novērtētu genotipu slāpekļa izmantošanas efektivitāti (NUE).



4.att. Korelācijas koeficienti starp  $V_{max}$  un NUE dažādos audzēšanas apstākļos

## Kontaktinformācija

FLPP - Izp-2019/1-0371

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Karīna Beinaroviča,  
Inga Straupe

Latvijas Biozinātņu un Tehnoloģiju  
universitāte, Meža fakultāte

## Platlapju meža biotopu piemērotība dzeņveidīgo sugām un to ekosistēmu pakalpojumu novērtējums

### levads

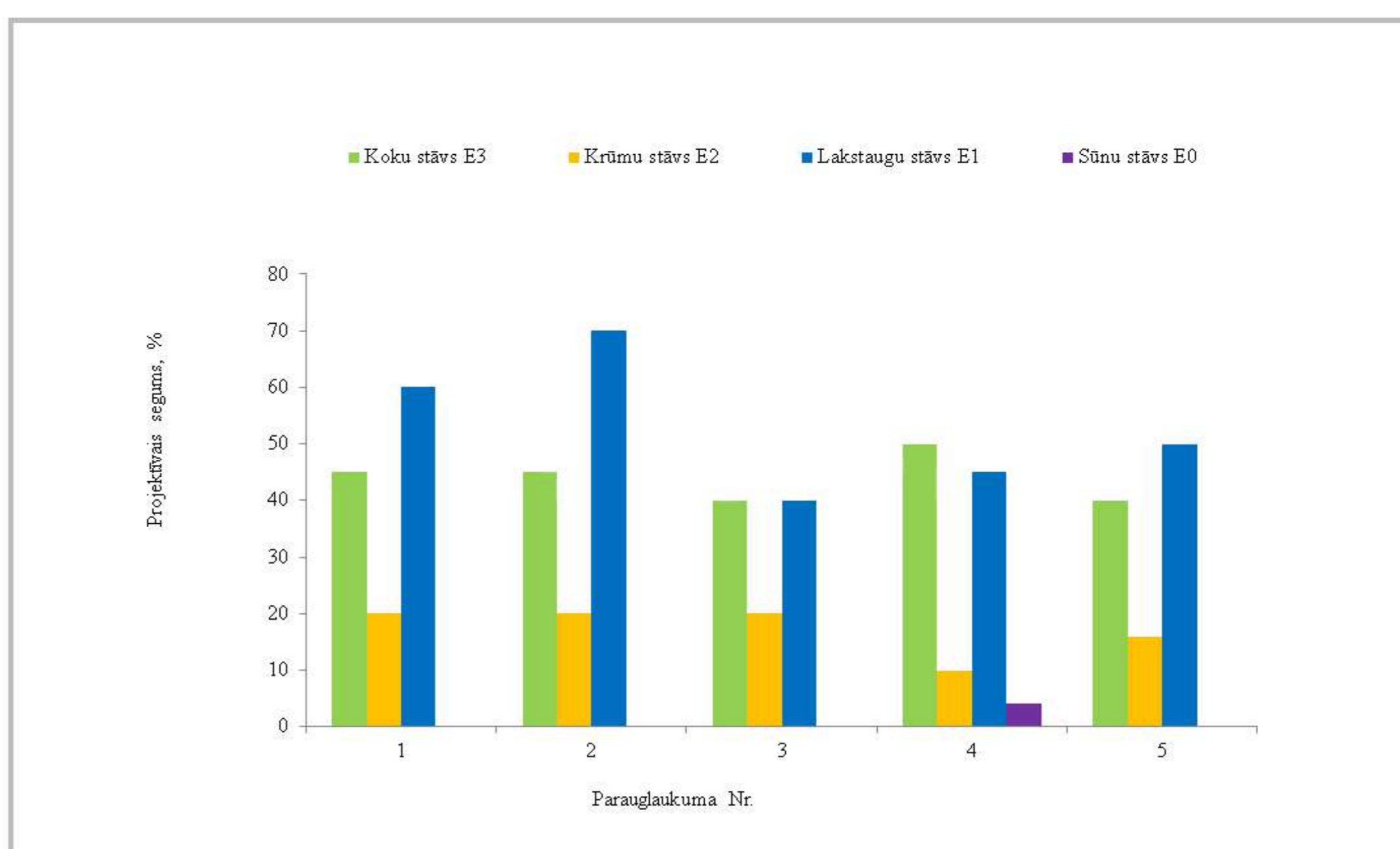
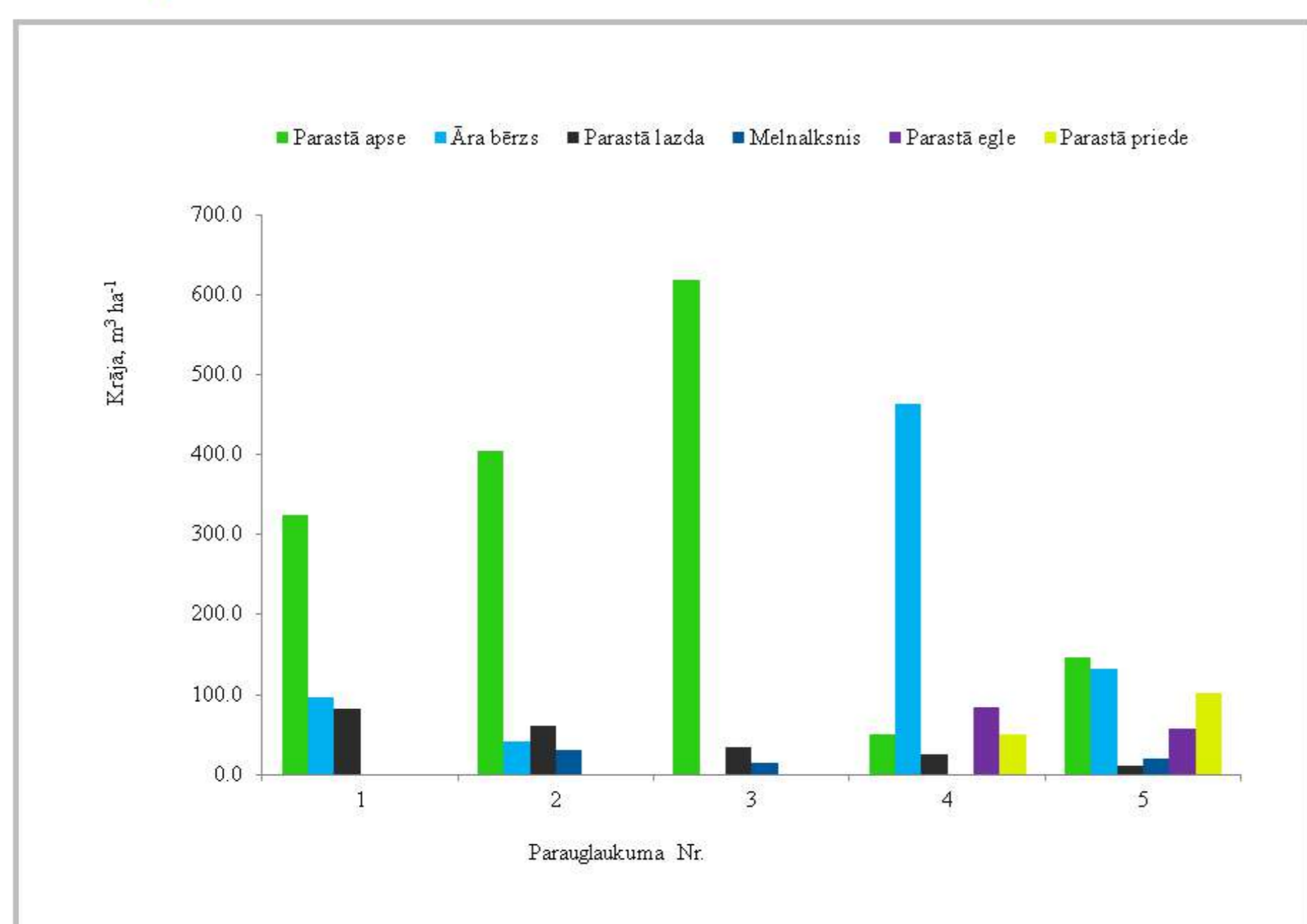
Pasaulē ir sastopamas vairāk nekā 200 dažādas dzeņveidīgo sugas, bet Latvijā no tām - deviņas sugas. Daļai sugu pēdējos gados ir samazinājies populācijas lielums, kā rezultātā šīs sugas ir aizsargājamas gan Latvijā, gan Eiropā. Galvenais iemesls ir atmirušās koksnes izvākšana, kura kalpo kā dzīvotne dzeņveidīgo sugu barības bāzei - koksne dzīvojošajiem kukaiņiem (Mikusinski, Angelstam, 1997). Kādi ir pārējie mežaudzi raksturojošie struktūrelementi šo putnu sugu dzīvotnēs, kas arī iespējami veicina šo sugu piesaisti, ir maz pētīts. Platlapju meži Latvijā ir izplatīti visai maz – platlapju koku audzes aizņem vien 1% no kopējās mežu platības un tādēļ tie ir aizsargājami biotopi.

### Pētījuma mērķis

Vecu platlapju meža biotopi ir vispiemērotākie dzeņveidīgajiem, kas pārtiek no koksne dzīvojošajiem kukaiņiem (Roberge et al., 2008). Pētījuma mērķis ir novērtēt platlapju meža biotopu piemērotību dzeņveidīgo sugām un veikt dzeņveidīgo sugu nodrošināto ekosistēmu pakalpojumu novērtējumu.



### Rezultāti un diskusija



No augošu koku krājas mežaudzē lielāko daļu veido parastā apse *Populus tremula* L., kuras vidējā krāja ir 308,7 m<sup>3</sup> ha<sup>-1</sup>, kā arī āra bērzs *Betula pendula* Roth, kura vidējā krāja ir 146,8 m<sup>3</sup> ha<sup>-1</sup>.

Atmirušās koksnes apjoms veido 71,2 m<sup>3</sup> ha<sup>-1</sup>. Lielāko daļu atmirušās koksnes krājas jeb 87% veido kritālas, savukārt sausokņi un stumbeņi veido 13% no kopējās atmirušās koksnes krājas.

Vislielākais veģetācijas projektīvais segums novērots tieši lakstaugu stāvam, aizņemot līdz pat 70%. Koku stāva projektīvais segums veido līdz 50%, savukārt krūmu stāvs - līdz 20% lielu projektīvo segumu.

### Secinājumi

Platlapju meža biotopi ir piemēroti dzīvotne dzeņveidīgo putnu sugām.

72% Jelgavas un novada iedzīvotāju būtu gatavi maksāt vidēji 1,00 EUR no personas un, attiecinot šo summu uz visiem iedzīvotājiem, noteikts, ka dzeņveidīgo putnu ekosistēmu pakalpojumu kopējā vērtība ir raksturojama ar aptuveni 883 614,00 EUR gadā lielu naudas summu.



### Kontaktinformācija

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# Physical activity and sleep quality of population in the digital transformation era

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Juris Grants, Jānis Žīdens, Monta Jakovļeva, Sandris Radziņš

Latvian Academy of Sport Education

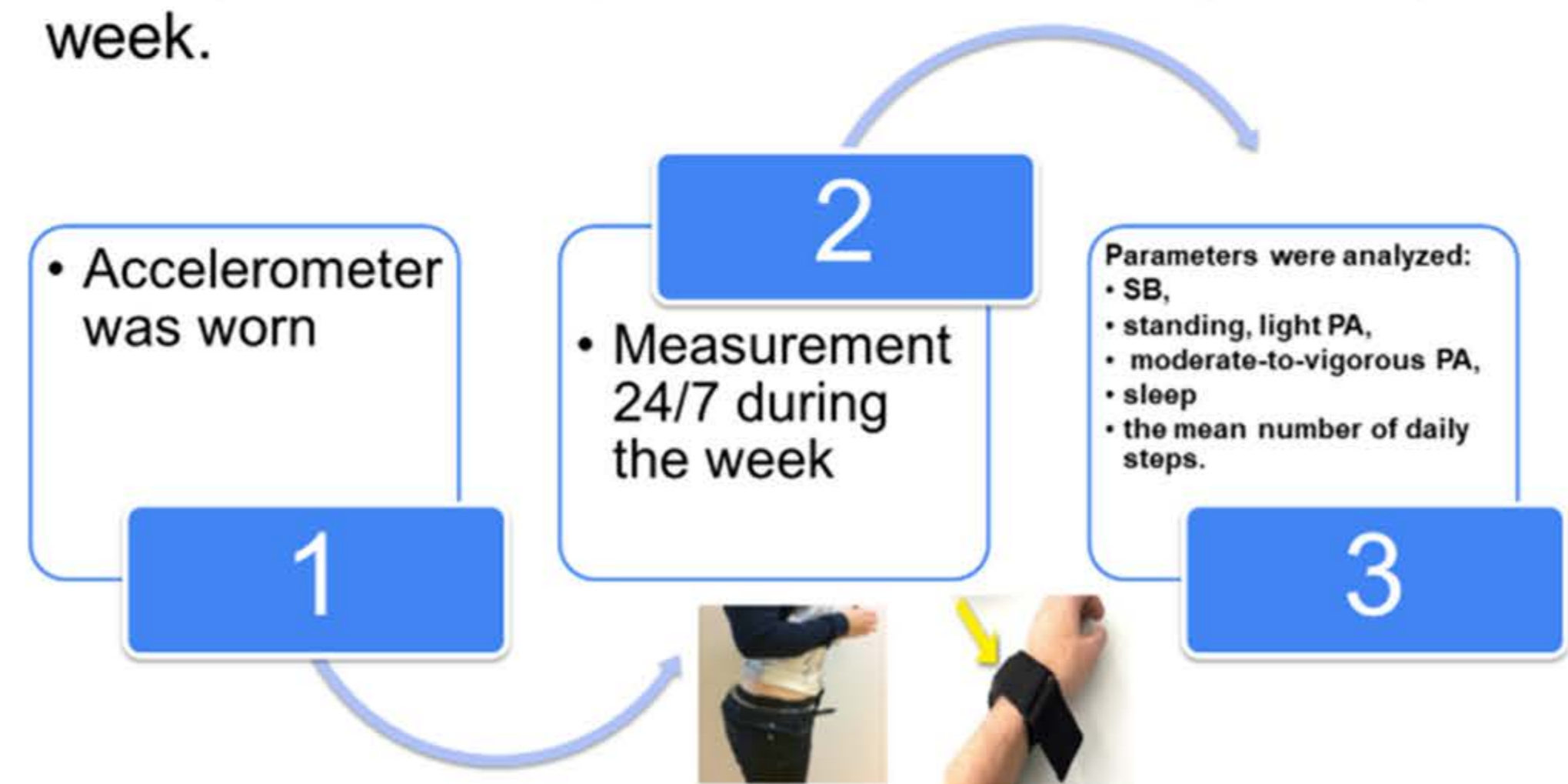
## Introduction

The digital transformation era increases population health risks associated with lack of exercise and emphasizes the role of an active lifestyle in sustainable socio-economic development. Physical inactivity is one of the four leading risk factors for global mortality (WHO, 2022), non-communicable diseases, mental health conditions (Santos et al., 2022) and accurate measurement of physical activity (PA) remains a challenge (Helmerhorst et al., 2012). Poor or insufficient sleep and physical inactivity are significant public health priorities (Kline, 2014) in the digital transformation era. The sleep is classified into three categories: awake, restless and restful (van Hees et al., 2015; Vasankari et al., 2019), Additional research into the relationship between physical activity and sleep is important.

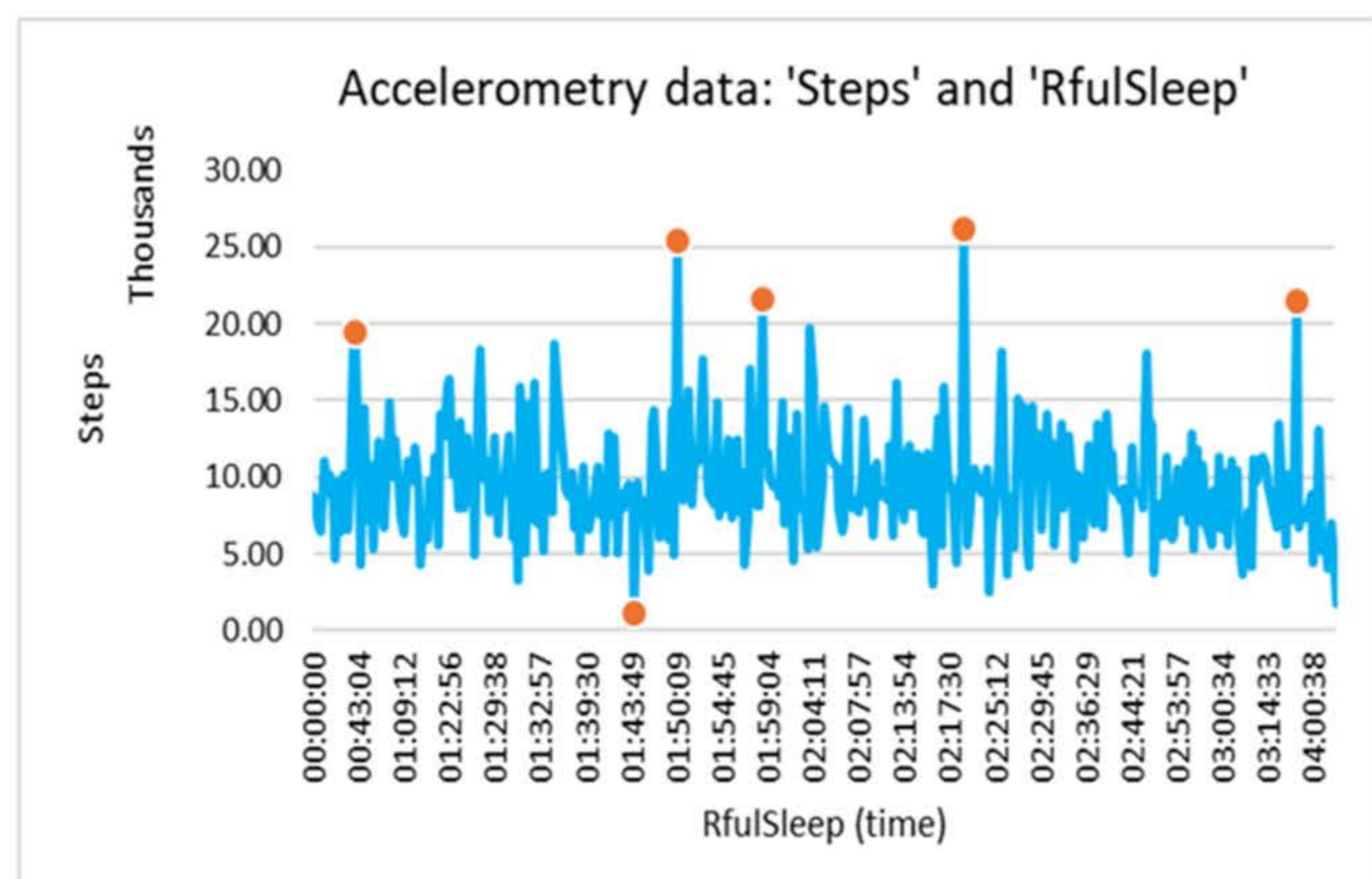
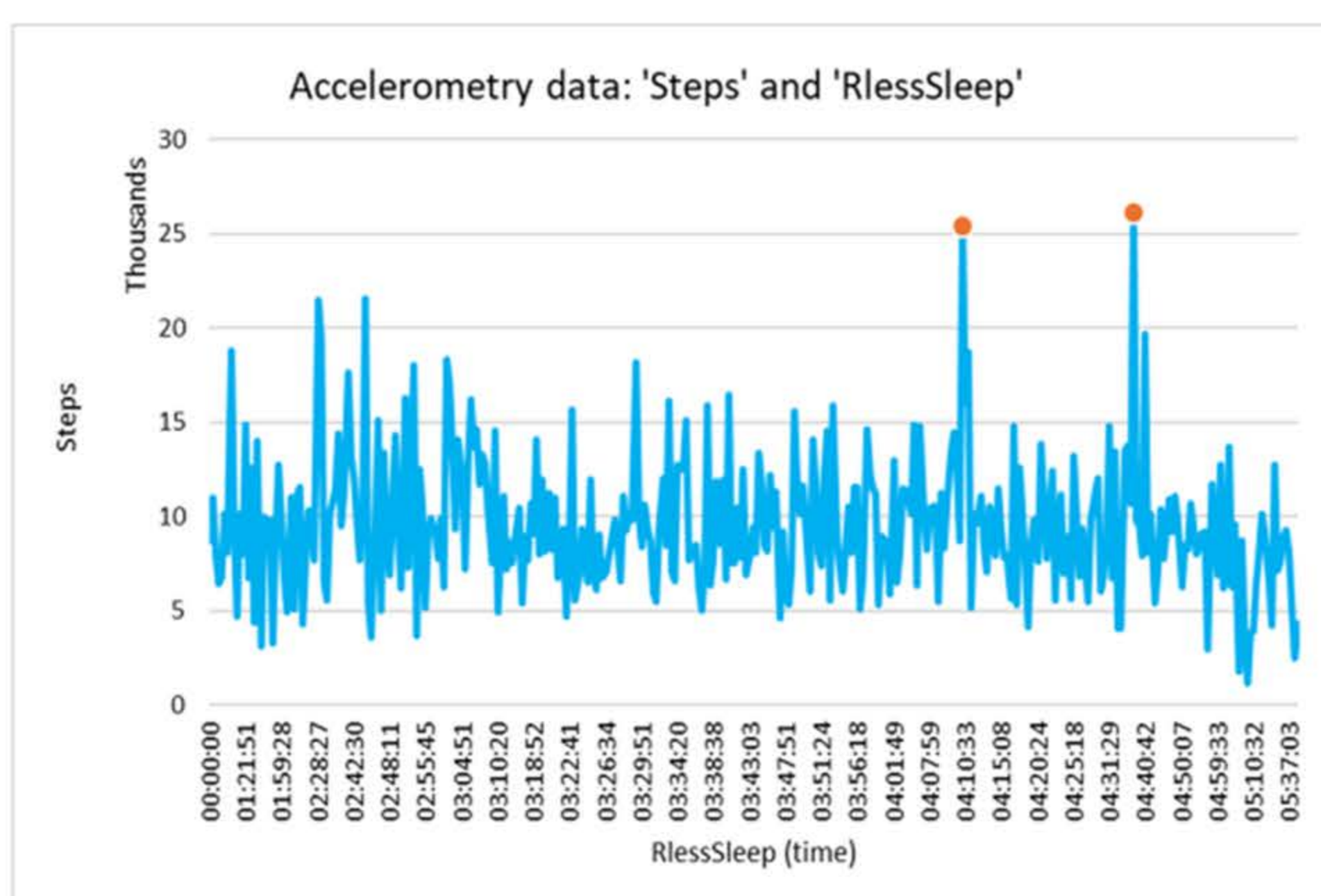
## Research Objective

The purpose of the research was to study population physical activity (PA), sedentary behaviour (SB) and sleep-time measured by a tri-axial accelerometer.

Methods: The study is based on the project "EUPASMOS" where PA, SB and sleep-time of the participants (n = 376) were measured by a tri-axial accelerometer 24/7 (UKK RM42, UKK Terveyspalvelut Oy, Tampere, Finland) during the week.



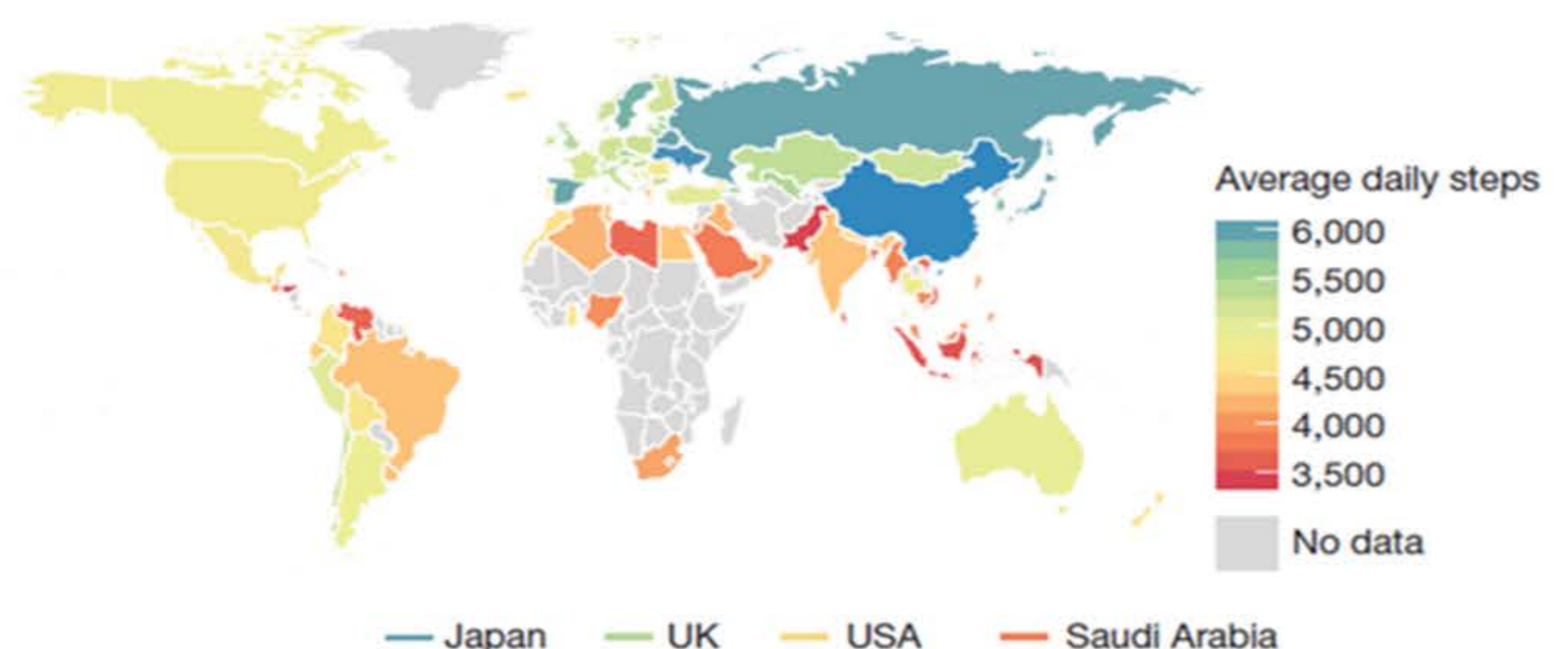
## Results & Discussion



Mostly participants spent their waking-hours sedentary. The mean of sedentary behaviour - 7h 48 min, time spent sitting on a usual day – 7h 31min to 8h 30min only 7% (Eurobarometer, 2022). Participants took on average 9437 steps/day, but 10 000 steps/day is a reasonable target for healthy adults (Tudor-Locke et al., 2011). Light PA - 4h 25min and moderate-to-vigorous PA - 1h 13min (recommended at least 150 minutes of moderate-to-vigorous (WHO)). The mean of sleeping time – 5h 49 min, but recommended a threshold value for adults ( $\geq 7$  hours per night) (Chaput et al., 2018). Pearson's correlation coefficient between average steps/day and restless ( $r=0.141$ ,  $p<0.05$ ), restful sleep parameters ( $r=0.125$ ,  $p<0.05$ ) are very low, but between average restless and restful sleep parameters ( $r=0.636$ ,  $p<0.05$ ) is moderate positive.

## Conclusions

Results showed that participants' insufficient sleep and physical inactivity are important health risks in the digital transformation era. Future research should focus on various components of physical activity (dose, mode, timing) effect on sleep.



(Althoff et al., 2017)

## Contact Information

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# Association between problematic social media use, problematic online gaming, and problem gambling in Latvian adolescents

Kristine Ozolina, Inese Gobina, PhD

Department of Public Health and Epidemiology, Riga Stradiņš University

## Introduction

Problematic social media use, gaming and gambling are emerging public health issues that may have a negative impact on adolescent well-being. However, more research needs to be done to determine to what extent these problematic behaviours coexist in adolescents. This study aimed to analyse the prevalence of problematic social media use, problematic online gaming and problem gambling, and the comorbidity of these behaviours among adolescents in Latvia.

## Results

A total of 50.1% (95%CI 48.1-52.1) of adolescents were problematic social media users, 8.7% (7.7-9.9) were problematic online gamers and 11.5% (10.3-12.8) were problem gamblers. The prevalence of problematic online gaming and problem gambling among boys was higher than in girls. In contrast, problematic social media use was more prevalent in girls (Figure 1).

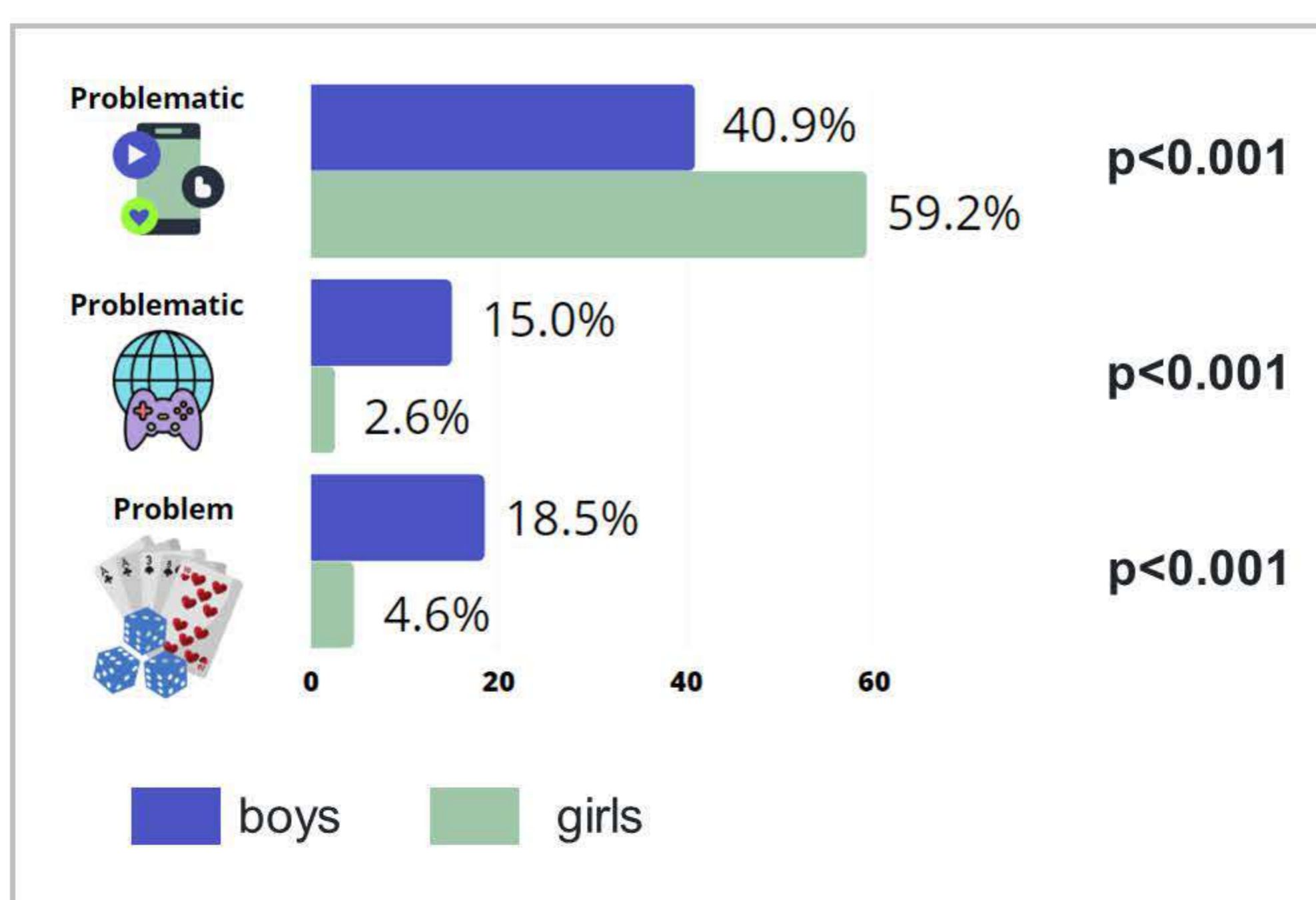


Figure 1. Prevalence of problematic social media use, online gaming and problem gambling in gender groups

In total, 41.0% of adolescents had problematic social media use alone, 2.5% problematic online gaming alone, and 5.5% problem gambling alone. Overall, 1.2% of adolescents reported all three problematic behaviours (Figure 2).

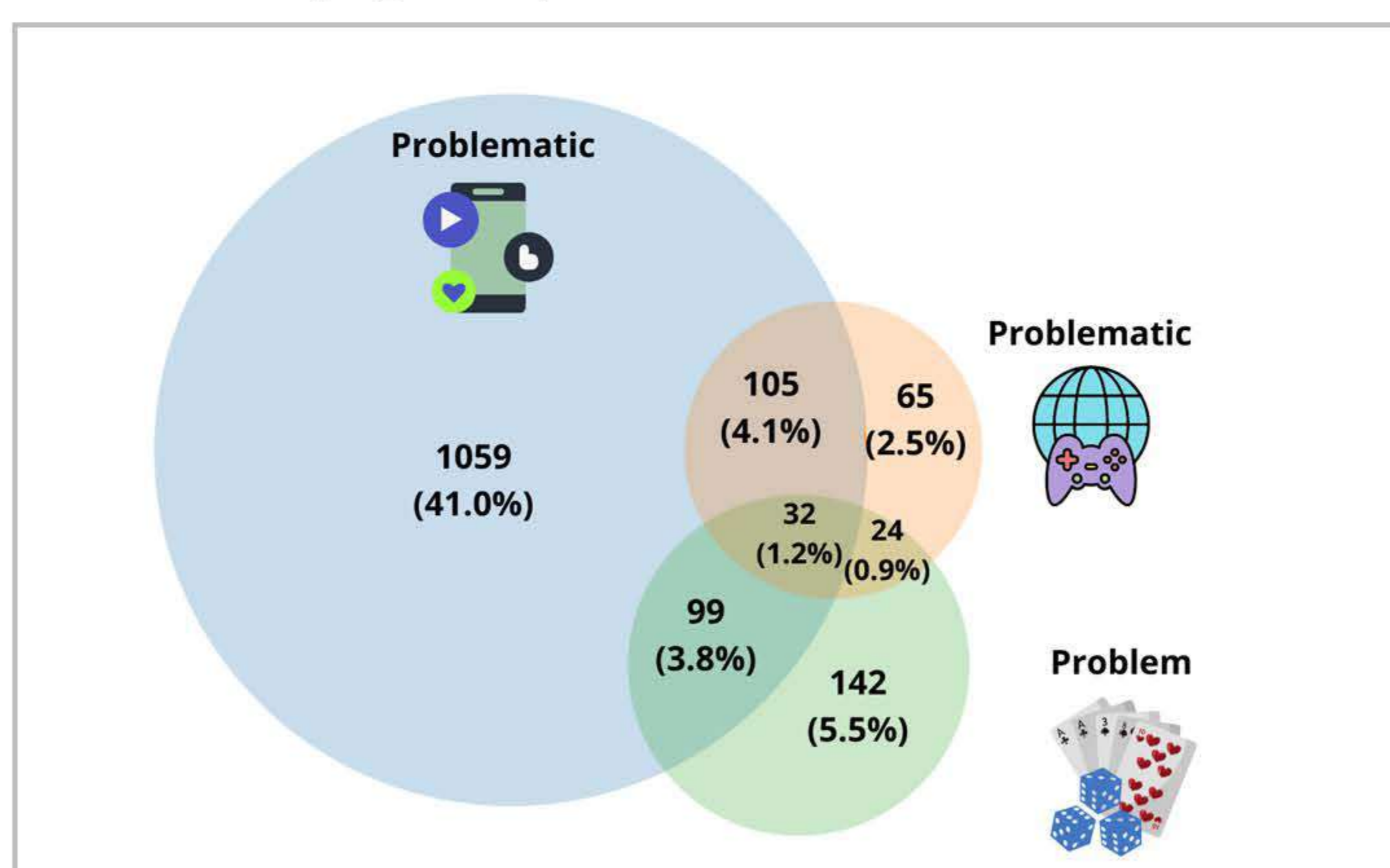


Figure 2. Co-occurrence of problematic social media use, online gaming and problem gambling in adolescents

## Methods

Data from a nationally representative sample of Latvian adolescents aged 15-16 were used (n=2584) collected within the European School Survey Project on Alcohol and Other Drugs (ESPAD) in 2019. Problematic behaviours were assessed using self-reported data of three different scales: "Self-perceived problems related to Social Media" scale, "Problematic Online Gaming Questionnaire Short-Form", and "Consumption Screen for Problem Gambling". Comorbidity was determined using cross-tabulation and visualised in Meta-chart.com with proportional Venn diagrams.

Both genders reported higher prevalence of problematic social media use alone (Figures 3 & 4). Boys had higher prevalence of problematic online gaming and gambling behaviour alone and all groups of comorbidity (Figure 3), while girls reported significantly higher prevalence of problematic social media use alone (Figure 4).

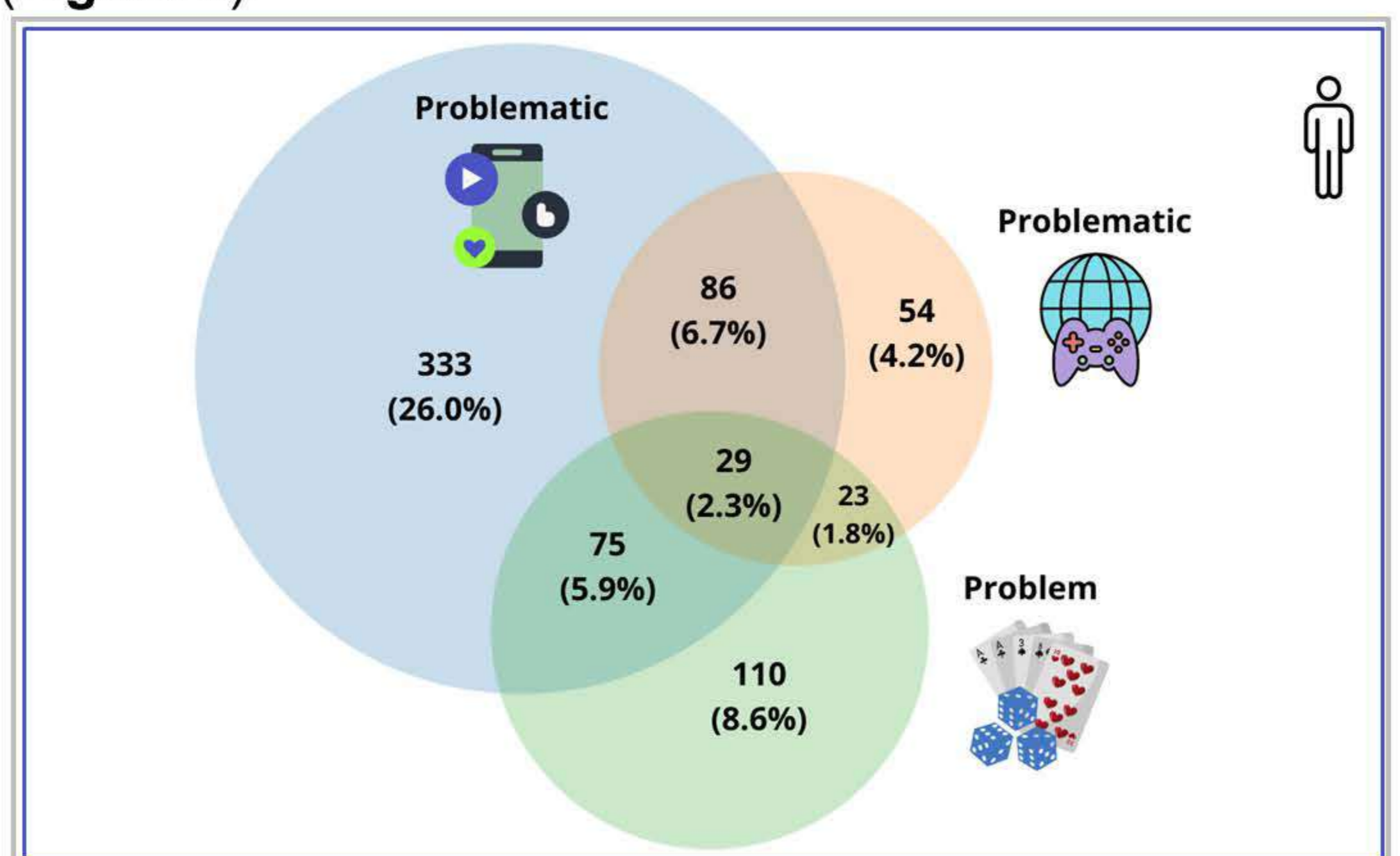


Figure 3. Co-occurrence of problematic social media use, online gaming and problem gambling in boys

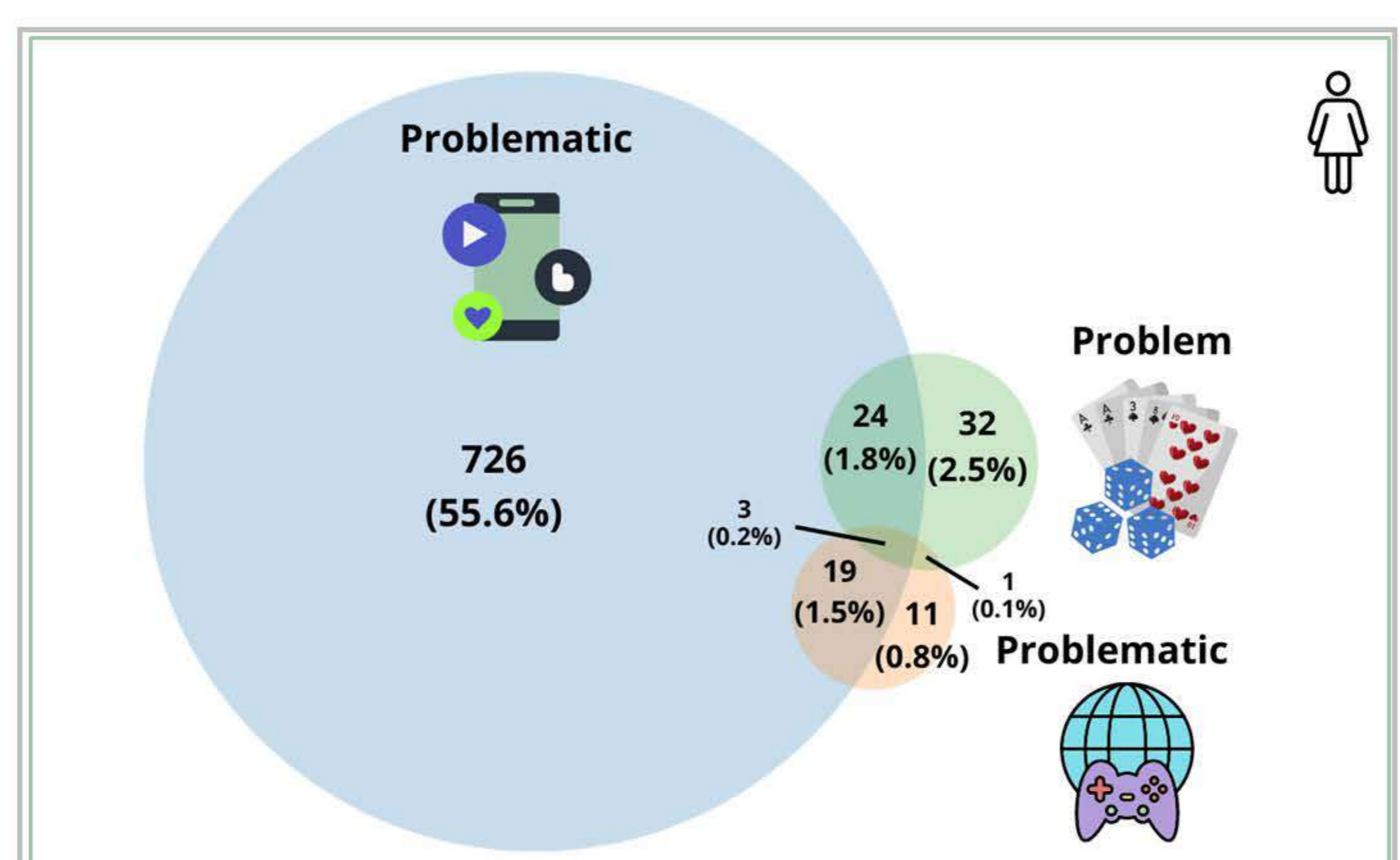


Figure 4. Co-occurrence of problematic social media use, online gaming and problem gambling in girls

## Conclusions

For both genders, problematic social media use alone is the most prevalent, but boys report the comorbidity with problematic online gaming or problem gambling significantly more than girls.

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# The Importance of the Human Factor in Today's Business Environment



Henrijs Kaļķis, Dr.sc.admin., profesors  
Ženija Roja, Dr.med., asoc.profesore  
Romāns Putāns, Dr.sc.admin., profesors  
University of Latvia & Latvian Ergonomics Society



## Introduction

We live in an age of rapid environmental, demographic and technological change. The introduction of new work models and new technologies has created new challenges for ergonomics professionals. Every sector of the economy is increasingly focused on increasing productivity, technological development, ensuring entrepreneurship and the long-term competitiveness of the organization. Production automation and robotics are important, which is one of the goals of technical progress in the industry 5.0. The scientific research in this direction will help to understand the importance of human factors and ergonomics in the work process, to understand that all of the considered areas of ergonomics are interrelated, that a person at work and his work abilities, limitations, requirements are indispensable in any business environment.

## Research Objective

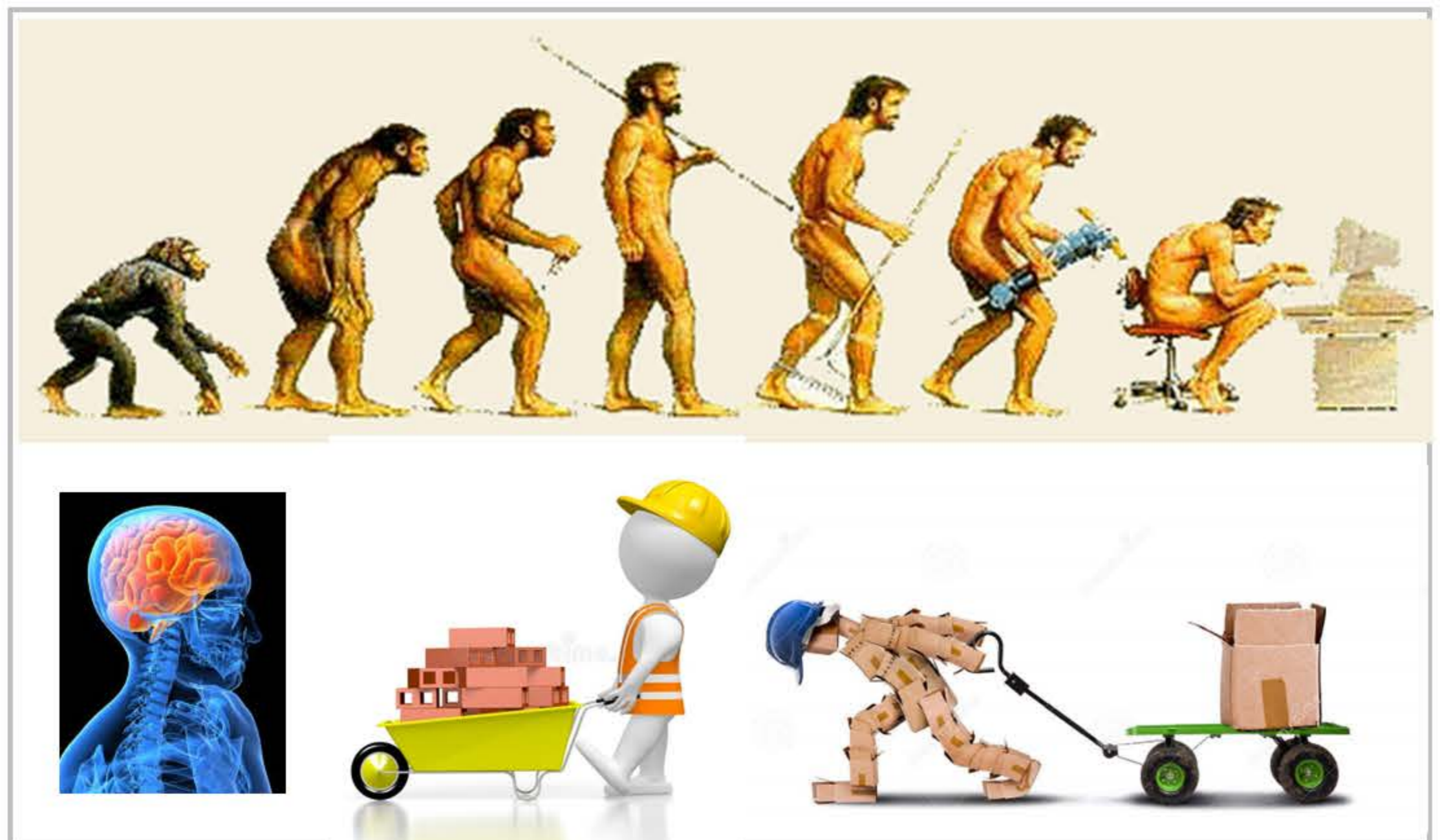
The aim of the research was to investigate the Importance of the human factor in today's business environment, considering the latest researches and business trends in the field.

The human factors data have been gained in chosen business operations on employees' fatigue level, energy expenditure, physical and mental work abilities, cognitive ergonomics stress influence by applying qualitative and quantitative research methods. The business performance evaluation at the organisations was carried out and involved error and fault analysis (FTA), and failure mode and effect analysis (FMEA method) in connection with human factors at the work environments, as well as ergonomic stress influence on workers, based on mathematical calculations, including assessment of costs and benefits.

## Results & Discussion



Researchers in the process of gaining practical research results at the metal manufacturing organisation (2021)



The scientific basis of latest methods and approaches in the human factors and ergonomics in today's business environment was developed. Several practically applicable ergonomics and human factors research methods have been identified, as well as cost-benefit analysis methods have been selected. The main research results were as follows: created the model of human factors and ergonomics management in today's business environment and system "Human-Machine-Environment" showing the improvement opportunities and worked out practical scientifically granted guidelines in improvement opportunities for preventing ergonomic mental and physical in contemporary business environment showing cost and benefit analysis.

## Conclusions

The human factor plays a major role in today's business environment especially in the industry 4.0 and industry 5.0 developments. While technological advancements and automation have transformed many aspects of business operations, the significance of human factors and Ergonomics will be more evaluated due to rapid focus on customization and cognitive abilities.

Clients do not come first.  
**Employees come first.**  
If you take care of your  
employees, they will take  
care of the clients.

- Richard Branson



## Contact Information

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# Mūsu sadarbība ar lielajiem zinātnes centriem

Uldis Bērziņš

Atomfizikas un Spektroskopijas Institūts un nacionālā zinātnes platforma "Fotonika-LV"  
Latvijas Universitāte

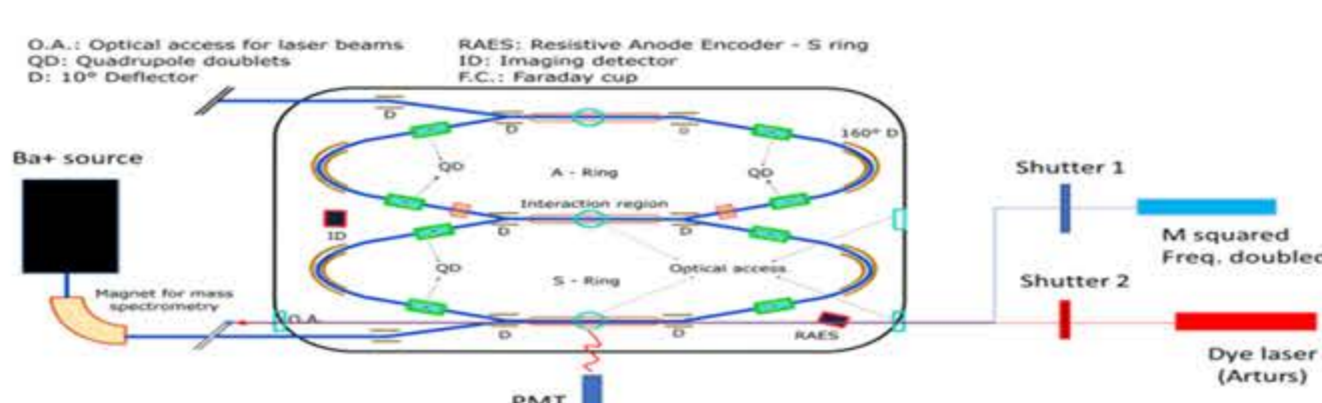
## Ievads

Augstākā līmeņa pētniecība un inovācijas visintensīvāk attīstās lielajās zinātniskajās laboratorijās. Tajās ir pieejama dārga tehnika un sarežģīta infrastruktūra, kādu Latvijai nav pa spēkam iegādāties un uzturēt. Pētījumu veikšana uz šādām modernām iekārtām ļauj augt un sasniegt pasaules klases rezultātus, gan pieredzējušiem pētniekiem, gan jaunajiem zinātniekiem. Kopš 2021 Latvijai kļūstot par **CERN** asociēto dalībvalsti mums ir pieaugusi iespēja veikt eksperimentus šajā, vienā no pasaules vadošajiem zinātnes centriem. Šeit dalīšos ar savu pieredzi un rezultātiem, kas iegūti pētot radioaktīvos jonus **ISOLDE** laboratorijā. Bez šī mēs vēl piedalāmies **COST** programmā, caur kuru Zviedrijā veicām ilgi dzīvojošu metastabilo jonu pētījumus izmantojot jonu slazdu **DESIREE**, pie vakuuma  $10^{-14}$  mbar un temperatūras 13 °K.

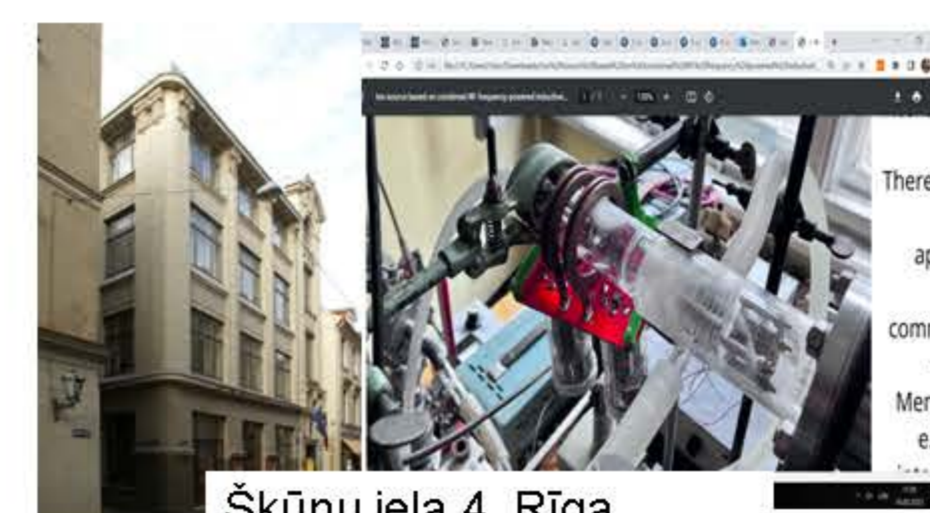
## Pētījuma mērķis

Galvenais mērķis ir zināšanu pilnveidošana un izpratne par **atomāro sistēmu struktūru un dinamiku**. Pētījumi tiek veikti ciešā sadarbībā ar zinātnieku grupām no **CERN un Zviedrijas universitātēm**: Stokholmas, Gēteborgas un Malmes. Informāciju par **elektronu un kodolu struktūru** iegūst veicot **elektronu piesaistes enerģijas** mērījumus dažādiem **hlora negatīvo jonu izotopiem** izmantojot radioaktīvo jonu slazdu pie **ISOLDE** CERNā. **Elektronu un jonu dinamika** tiek pētīta mērot ilgi dzīvojošu **metastabilo jonu dzīves laikus** kosmosam līdzīgā vidē izmantojot **jonu ciklotronu DESIREE** Stokholmā. Papildus eksperimenti un sagatavošanās mērījumiem pie partneriem notiek LU ASI Atomfizikas, Atmosfēras Fizikas un Fotoķīmijas Laboratorijā, Šķūņu 4, Rīgā. Pakārtotais mērķis ir institūtā audzēt publikāciju skaitu Q1 vai pat Nature klases fizikas žurnālos, un vairot personālu un studentus ar pieredzi modernos zinātnes centros.

ISOLDE, CERN



DESIREE, Stockholm



Šķūņu iela 4, Rīga



## Rezultāti un diskusija

- 1) Noslēgts kontrakts starp CERN un ASI par Uldi Bērziņu kā lietotāju (user) pie ISOLDE ar laiku 10% gadā uz trim gadiem. Ir izpildīta pirmā darba vizīte kuras laikā nodemonstrēta iespēja mērīt Elektronu piesaistes enerģiju Hlora negatīvajā jonā izmantojot radioaktīvo jonu slazdu. Rezultāts ir noziņots Pasaules kodolfiziku Kongresā un tiek gatavots manuskripts iesniegšanai Physal Review Letters (Imp.fac.=9.16) . Gatavojamies nākošajai vizītei CERN.
- 2) Ir sagatavoti un iesniegti projekti par kūļa laiku izmantošanu DESIREE un divas reizes ASI komanda ir veikusi eksperimentus mērot Ba metastabilā jona dzīves laiku. Iegūtais rezultāts  $80.1 \pm 1.0$  sekundes ir ir uz iespēju robežas, gan garuma, gan precizitātes ziņā. Rezultāti ļauj 5x precīzāk nekā līdz šim novērtēt bārija klātbūtni astrofizikālajos objektos. Tiek gatavots manuskripts iesniegšanai "Journal of Physical Chemistry and Chemical Physics" (Imp.fac.=3.68). Gaidam rezultātus no nākamā kūļa laiku konkursa.

## Secinājumi

**MĒS VARAM** veiksmīgi sadarboties:

- gan ar pasaules mērogā CERN, gan Eiropas mērogā DESIREE,
- tā var būt produktīva, ja ir diezgan ilga pieeja (2 nedēļas) iekārtai pie partneriem,
- ir nepieciešama sava "mājas" laboratorija un bāzes iekārta,
- ir nepieciešams savs tekošais projekts ar finansējumu ceļošanai un darbam "mājās".

## Pateicība un Kontaktinformācija

Saņemts atbalsts no ERDF projekta No. 1.1.1.5/19/A/003: "Kvantu optikas un fotonikas attīstība Latvijas Universitātē"

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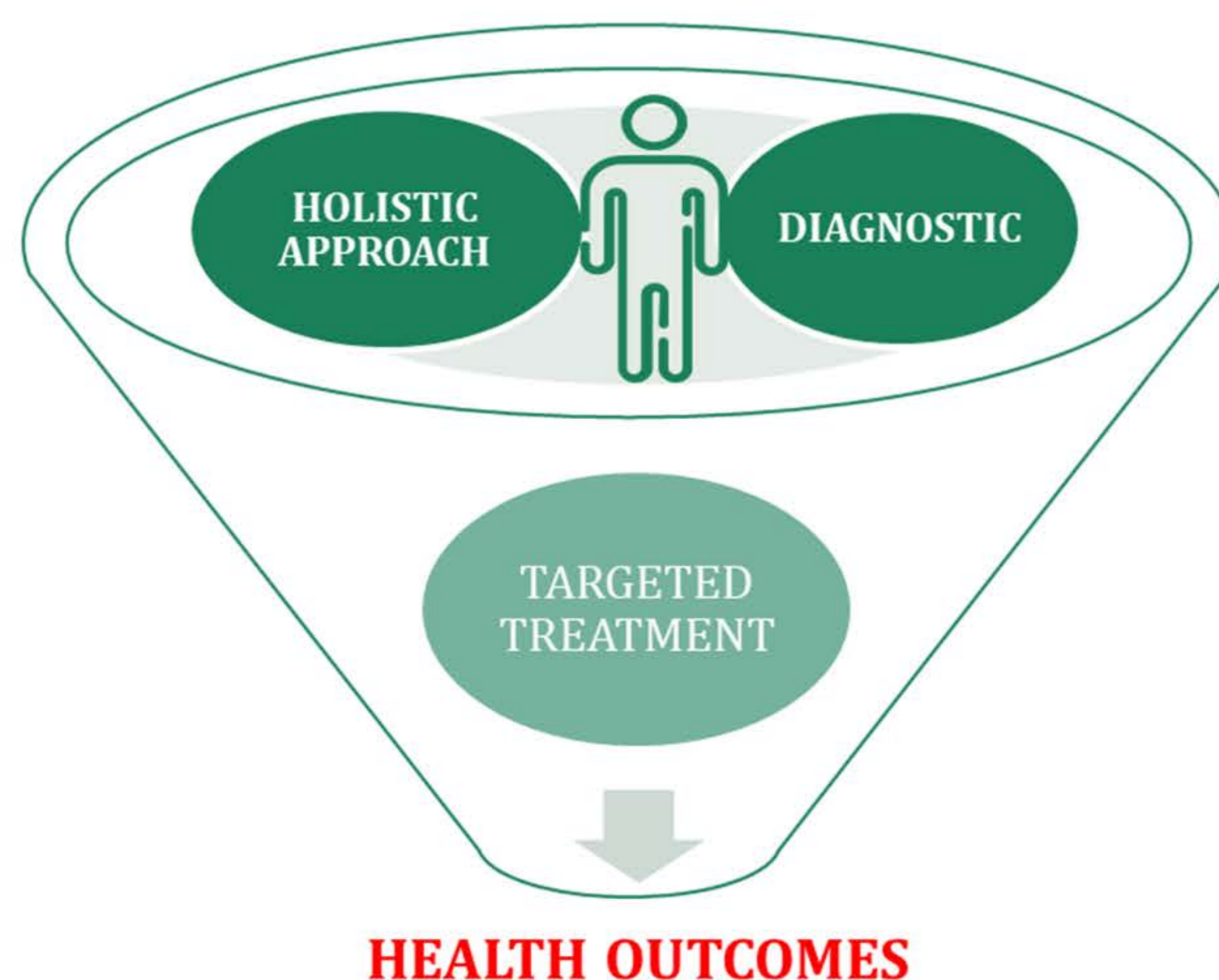
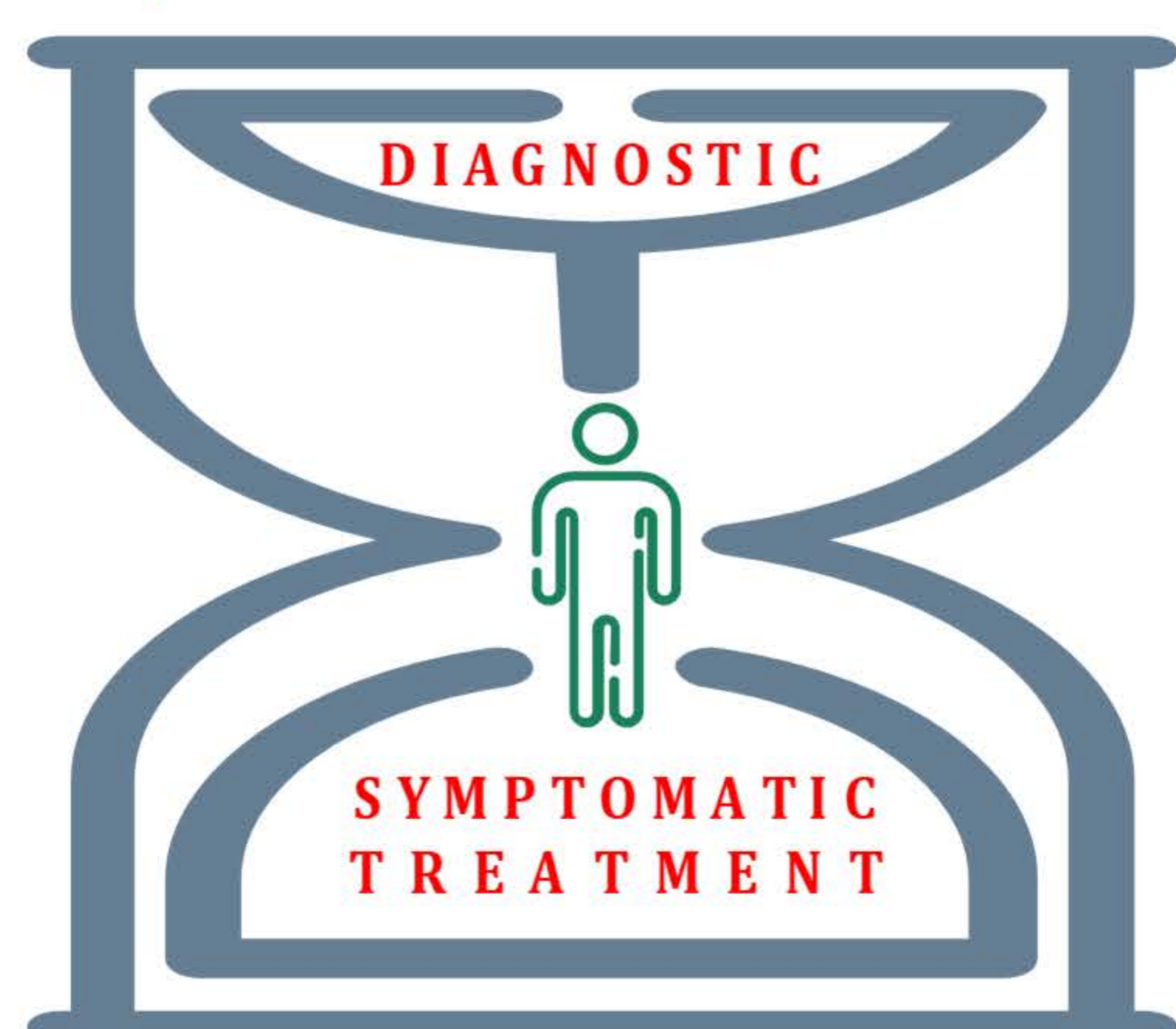
## Introduction

The category "diseases of unknown aetiology" includes many diseases that are largely related to autoimmune disorders, such as lupus and rheumatoid arthritis, chronic fatigue syndrome (CFS) and fibromyalgia, multiple sclerosis, and others. The prevalence of these disorders has been increasing in recent years, including CFS, which correlates strongly with the manifestations of post-COVID conditions [1]. CFS can be viewed from different perspectives – as a single phenomenon, a complex disease such as myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS), or chronic fatigue as a medical condition accompanying other diseases. ME/CFS is a poorly understood, serious, complex, multisystem disorder, characterised by symptoms lasting at least six months, with severe incapacitating fatigue not alleviated by rest, and other symptoms – many autonomic or cognitive in nature, lead to substantial reductions in the functional activity and quality of life [2].

## Research Objective

ME/CFS as a classic example of a disease of uncertain aetiology demonstrates the diversity of symptoms and the corresponding diagnostic complexity. However, even in the case of a successful diagnosis, the choice of treatment is an issue, as the psycho-emotional spectrum of the disease and the impact on the patient's cognitive abilities are of increasing importance. It is often observed that in diseases of unclear aetiology, significant investments are made in improving diagnostics and developing biomarkers, while post-diagnosis therapy is symptomatic and generalised (Figure 1). Consequently, the research question focused on additional opportunities to improve diagnostic and treatment outcomes in diseases of uncertain aetiology.

## Results & Discussion



Theoretical and empirical studies show that a holistic approach is particularly important in diseases of unclear aetiology. Moreover, the authors suggest that a holistic approach is important not only in the treatment but also in the diagnostic process (Figure 2). One of the main advantages of a holistic approach is that it can involve looking at a patient's lifestyle, diet, stress levels, and emotional state, and can provide a more comprehensive diagnostic and personalised treatment plan. Thus, the authors focus on the potential of a multidisciplinary approach to healthcare team building and on the phenomenon of holistic health coaching, which assists patients to clarify their goals, becoming aware of their personal resources, actively engaging in treatment, and moving toward desired goals.

## Conclusions

According to the scientific literature, coaching is used successfully in healthcare, but there is a lack of studies on diseases of uncertain aetiology. Therefore, the authors' performed case study that showed positive results of coaching in the treatment of ME/CFS and post-COVID-19 patients [3] can be used for further research on coaching in diagnosis setting and treatment of diseases of unclear aetiology.

## Contact Information

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Authors' scientific articles related to the topic:

1. Arāja, D., Berķis, U., & Murovska, M. (2022). COVID-19 Pandemic-Revealed Consistencies and Inconsistencies in Healthcare: A Medical and Organizational View. *Healthcare (Basel, Switzerland)*, 10(6), [1018].
2. Arāja, D., Berķis, U., Lunga, A., & Murovska, M. (2023). Shadow Burden of Undiagnosed Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS) on Society: Retrospective and Prospective – In Light of COVID-19. In G. Ricevuti, & L. Lorusso (Eds.), *Chronic Fatigue Syndrome/ Myalgic Encephalomyelitis: Diagnosis and Treatment* (pp. 122-139). MDPI.
3. Arāja, D., Krūmiņa, A., Berķis, U., Nora-Krūkle, Z., & Murovska, M. (2023). The Advantages of an Integrative Approach in the Primary Healthcare of Post-COVID-19 and ME/CFS Patients. In S. Palermo, & B. Olivier (Eds.), *COVID-19 Pandemic, Mental Health and Neuroscience - New Scenarios for Understanding and Treatment: New Scenarios for Understanding and Treatment* (pp. 217-230). IntechOpen.

# Relationship between vaccination intention and Health Belief Model constructs during the COVID-19 pandemic

Sandra Feldmane, Kristīne Mārtinsone, Viktorija Perepjolkina  
Rīga Stradiņš University, Faculty of Public Health and Social Welfare

## Introduction

Vaccination intention and effective vaccination strategies development and implementation during the COVID-19 pandemic may reduce the number of hospitalized people with COVID-19, as well as reduce mortality rates related to COVID-19 (WHO, 2021). Despite the availability of vaccines, the vaccination intention is one of the main influencing factors the world is facing due to COVID-19 pandemic (WHO, 2021).

**Aim of this study was to determine relationship between vaccination intention and the Health Belief Model constructs during the COVID-19 pandemic.**

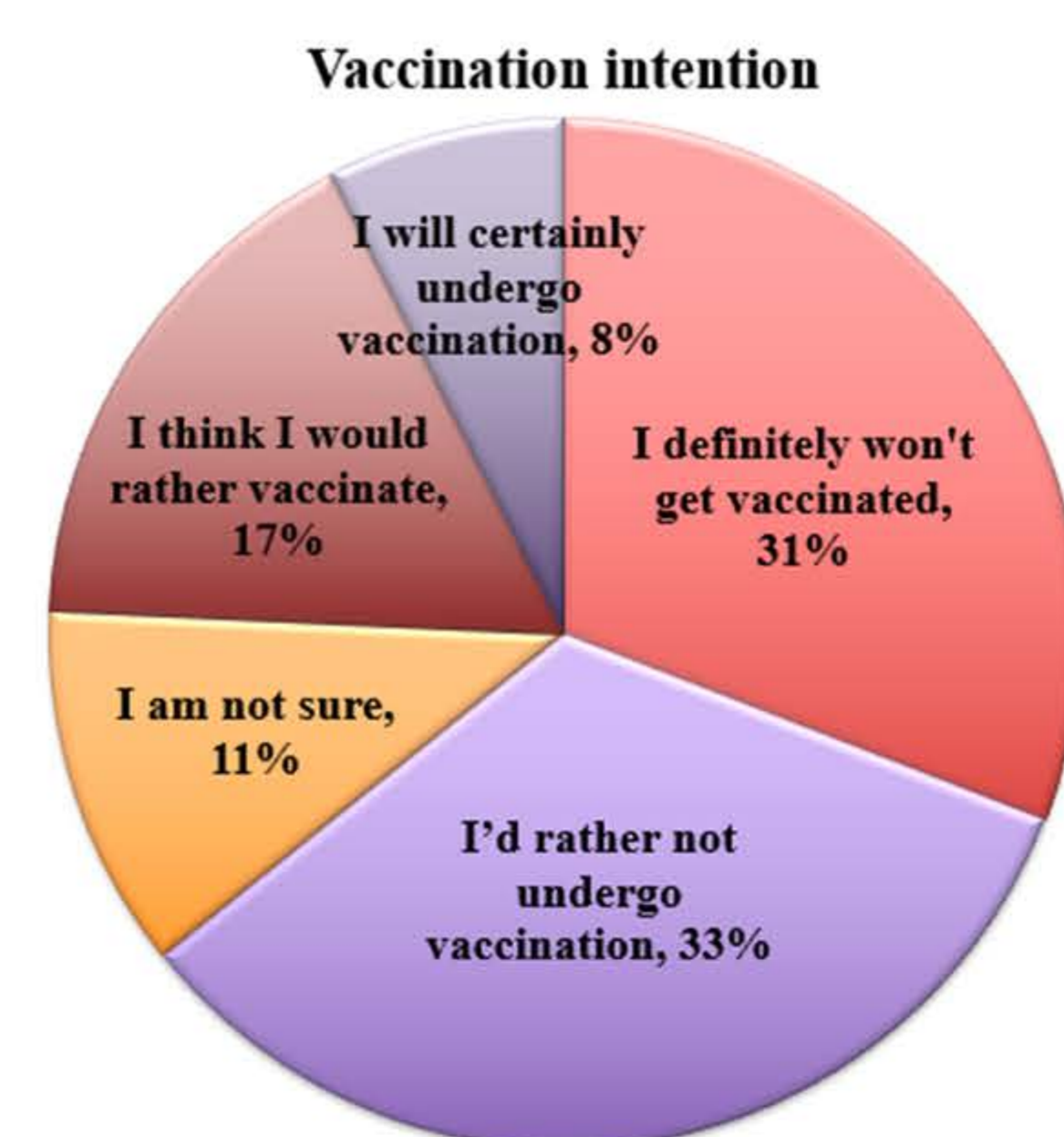
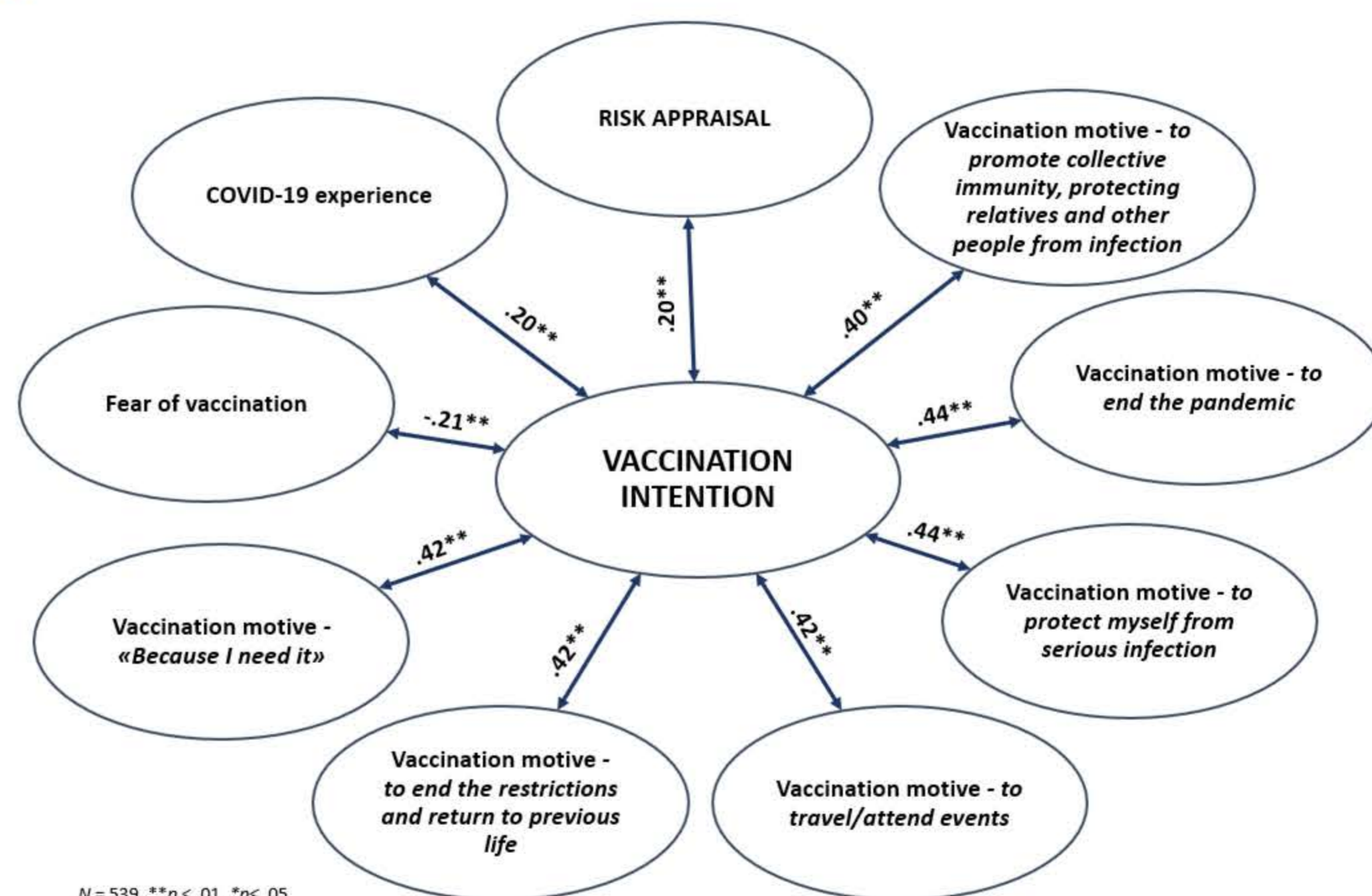
## Research Objective

**SAMPLE:** 539 respondents (52.9% males, age 18 to 75, M = 45.35, SD = 15.70) who were not vaccinated against COVID-19. They were selected from a sample representative of the Latvian population surveyed by the INTERFRAME-LV study (N = 1017).

**PROCEDURE:** Data was collected from 10th to 22nd September 2021 by conducting direct interviews at the respondents' residences, under The national research program "Challenges and solutions for Latvia's state and society in an international context (INTERFRAME-LV)

**INSTRUMENTS:** The data was collected using demographic data questionnaire and instruments based on the Health Belief Model constructs: perceived threat of disease as risk appraisal ( $\alpha = .64$ ); perceived benefits as vaccination motives (6 different motives); perceived barriers as fear of vaccination ( $\alpha = .92$ ); cues to action as COVID-19 experience.

## Results



The proportion of responses for intention to have a COVID-19 vaccine, a total of 64% participants responded no/rather no to COVID-19 vaccine intent, while only 25% responded yes/rather yes.

Statistically significant positive correlations were found between vaccination intention and risk appraisal, all six vaccination motives (to promote collective immunity, protecting relatives and other people from infection; to end the pandemic; to protect myself from serious infection; to travel/attend events; to end the restrictions and be able to return to previous life; because I need it) and COVID-19 experience (e.g. a person and/or a family member, a friend got sick with COVID-19 or someone died from it) ( $r = .20$  to  $.44$ ,  $p < .01$ ). The analysis showed that people with higher vaccination intention for other individuals were significantly more likely to have many different motives to get vaccinated against COVID-19, perceived higher personal risk of contracting the COVID-19 and had COVID-19 experience.

Statistically significant negative but weak correlations were found between vaccination intention and fear of vaccination ( $r = -.20$ ,  $p < .01$ ). The analysis showed that people with higher vaccination intention for other individuals were significantly more likely have lower fear level of vaccination.

## Conclusions

The results of this study show the importance of the perceived threat of the disease, many different vaccination motives (to promote collective immunity, protecting relatives and other people from infection; to end the pandemic; to protect myself from serious infection; to travel/attend events; to end the restrictions and be able to return to previous life; because I need it), the belief that the vaccine will not cause significant side effects and long-term consequences and COVID-19 experience in the COVID-19 vaccination intention in sample of adults in Latvia.

## Contact Information

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**All questions about the research please ask on the congress platform**

# Glucose variability in patients with type 1 diabetes and diabetic kidney disease – a pilot study

Fedulovs Aleksejs<sup>1</sup>, Kučaja Olga<sup>1</sup>, Janeviča Jana<sup>1,2</sup>, Krūzmane Lelde<sup>1,2</sup>, Puzirevska Irēna<sup>1</sup>, Folkmane Inese<sup>1,2</sup>, Sokolovska Jeļizaveta<sup>1</sup>.

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## Introduction

Type 1 diabetes (T1D) is the leading cause of kidney disease worldwide, including diabetic kidney disease (DKD). The major contributor to development of DKD is hyperglycemic burden.

**Design:** This was a cross-sectional case-control study. **Setting:** This study took place in Riga, Latvia, at the University of Latvia. Sample consists of 78 patients with T1D.

Progression of DKD was defined as estimated glomerular filtration rate (eGFR) decline  $\geq 3$  ml/min/year or increasing albuminuria stage over the last 3-6 years. FreeStyle Libre ProIQ Sensors were used for CGM. Average glucose, coefficient of variance, glucose management indicator (GMI), % of time: above target, in target, below target, low glucose events were analysed.

## Research Objective

Evaluate the association between the glucose variability assessed by continuous glucose monitoring (CGM) in patients with stable and progressive DKD and T1D.

**Why CGM:** Real-time data for a comprehensive view of glucose fluctuations. Accurate detection of low blood sugar events, crucial for patient safety. Detailed assessment of glycemic control through Time in Range (TIR) measurements. Identification of glucose variability for assessing stability and management. Enablement of personalized diabetes management through real-time data for informed decision-making.

## Results & Discussion



### Charachteristics of groups

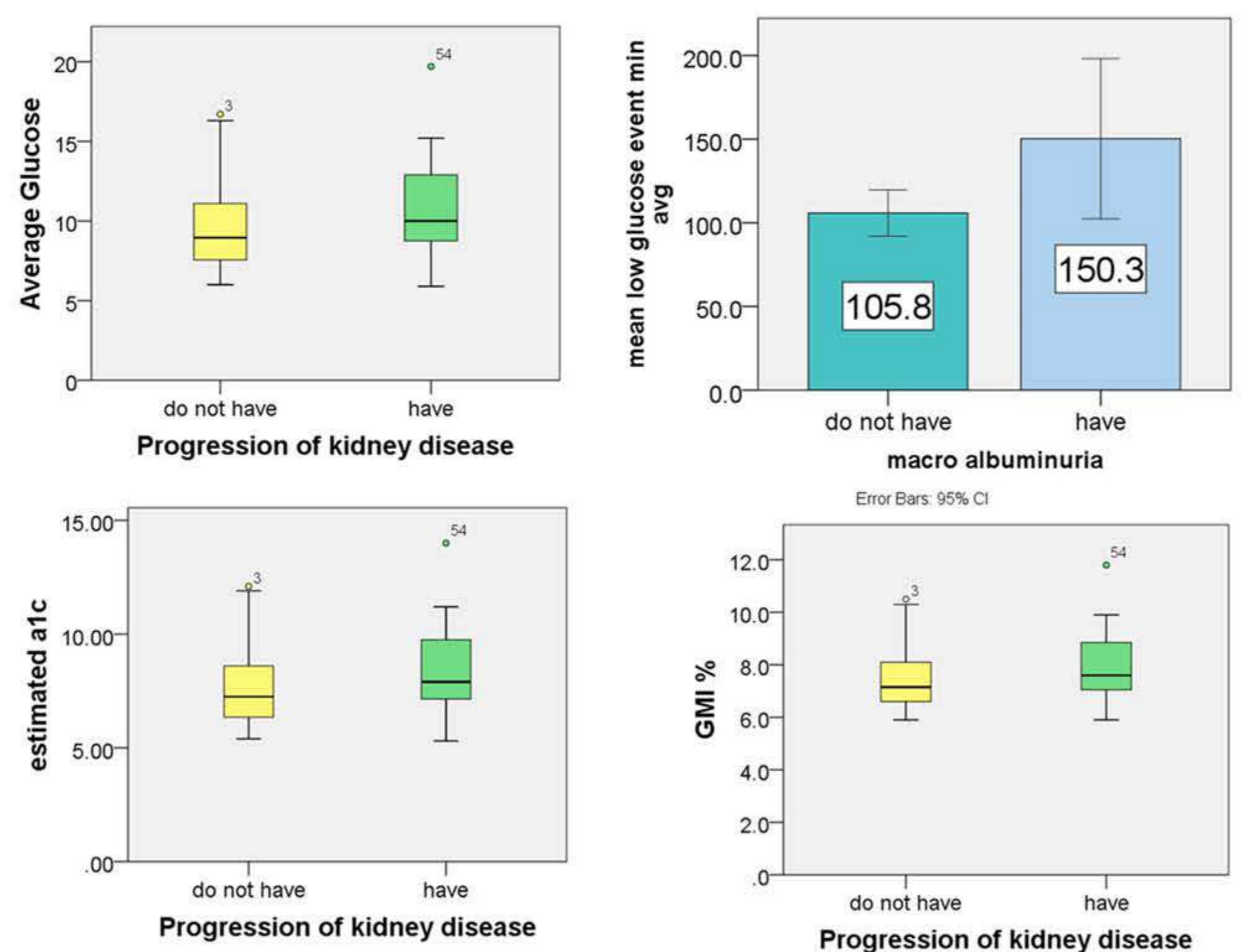
	Non progressors DKD, N = 43	Progressors of DKD, N = 35	P value
Male gender N (%)	19 (44.2%)	12 (34.3%)	0.37
Age, years	47.43 (35.03)	45.65 (36.78-52.72)	0.88
BMI, kg/m <sup>2</sup>	25.50(23.70- 28.30)	23.90(21.50-28.30)	0.29
Smokers, N (%)	7 (16.3%)	7 (20.0%)	0.57
Hypertension, N (%)	20 (46.5%)	27 (77.1%)	< 0.01
Length of diabetes, Years	22.00(13.00- 31.00)	27.00 (20.00-35.00)	0.03
Severe retinopathy, N (%)	13 (30.2%)	23 (65.7%)	< 0.01
HbA1c, %,	7.70(7.10-9.10)	8.80(7.60-9.90)	0.03
CVD, N (%)	4 (9.3%)	10 (28.6)	0.03
Kidney transplantation, N (%)	0 (0%)	4 (11.4)	0.02
Dialysis, N (%)	0 (0%)	7 (20%)	< 0.01

### CGM Charachteristics in study groups

	CGM (IQR)	Non progressors of DKD, N = 43	Progressors of DKD, N = 35	P value
Sensor days		15.00 (15.00-15.00)	15.00 (14.00-15.00)	0.15
Average glucose mmol/L		8.95(7.53-11.20)	10.00(8.70-13.10)	0.08
Coefficient of variance %		39.35(35.62-42.05)	39.70(35.70-50.00)	0.43
Glucose management indicator (GMI) %		7.15(6.60-8.15)	7.60(7.00-8.90)	0.09
% Above target		37.50(21.25-58.50)	44.00(32.00-62.00)	0.15
% in target		56.50(37.00-70.00)	46.00(35.00-58.00)	0.10
Low glucose events count		10.50(4.50-15.00)	7.0(4.00-16.00)	0.40
Low glucose events average minutes		108.50(75.00-132.25)	113.00(81.00- 174.00)	0.19
Estimated A1C %		7.25(6.32-8.65)	7.90(7.10-9.90)	0.09

## Conclusions

Several parameters of glucose variability were associated with DKD and demonstrated weak but significant correlations with liver transaminase ALT and in our pilot study. This might indicate on association of glucose variability, insulin resistance and DKD progression in T1D. .



## Contact Information

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Project Lzp-2020/1-0138 "Dissecting the associations between glucose variability, intestinal derangements and progression of diabetic nephropathy in type 1 diabetes". Research is being implemented thanks to the support of MikroTik, donation is administrated by University of Latvia Foundation.

# Spatially resolved transcriptomics analysis of cancer associated fibroblasts in pancreatic neuroendocrine tumors

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Latvian Biomedical Research and Study Centre  
research and education in biomedicine from genes to human



## Introduction

Pancreatic neuroendocrine tumors PanNETs are a group of malignancies arising from pancreatic islet cells. Histologically PanNETs are well-differentiated tumors and are classified into three grades (G1 - G3) based on mitotic count and Ki-67. So far few studies have characterized the transcriptome of PanNETs using either bulk or single-cell RNA-seq approaches. However, using the aforementioned methodologies results in a loss of spatial information which is vital to understand the tumor interactions with its microenvironment (TME). An indispensable component of TME is the stromal cells, particularly  $\alpha$ -SMA expressing cancer-associated fibroblasts (CAFs) which partake in an extracellular matrix organization, immune modulation, tumor growth, and treatment resistance. There is limited information on the overall gene expression profiles of PanNET CAFs and their impact on tumor cell gene expression profiles. Consequently, in this study using the **GeoMx Digital Spatial Profiler technology** we attempted to identify the key genes of  $\alpha$ -SMA positive cells in PanNET tumor tissues and evaluate the differences in gene expression profiles of tumor cells immediately adjacent to  $\alpha$ -SMA positive cells against tumor cells non-adjacent to  $\alpha$ -SMA positive cells.

## Study design

Within the study, eight retrospective cases PanNETs (three G1, four G2, and one G3) were included (**Figure 1**). FFPE tissue samples containing both tumor and adjacent normal tissues were hybridized with Cancer Transcriptome Atlas (CTA) panel oligos and stained with anti- $\alpha$ -SMA, SYP (Synaptophysin) antibodies, and SYTO-83 nucleic acid stain. For region of interest (ROI) selection, we selected four ROIs: tumor non-adjacent to  $\alpha$ -SMA+ stromal cells (A), tumor adjacent to  $\alpha$ -SMA stromal cells (B), acinar compartment (C), and islets of Langerhans (D) from adjacent pancreatic tissues. From each ROI a specific area of illumination was selected for CTA oligo release by UV laser-induced cleavage. AOI selection was based on tissue morphology and antibody stain to acquire stroma, tumor, acinar compartment, and islet-specific gene expression profiles. The released oligos were then sequenced on Illumina NovaSeq 6000 platform. The following data were processed using GeoMx® NGS pipeline and the output DCC files were then analyzed on GeoMx Data Analysis suite for differential expression analysis. Candidate genes were subjected to STRING physical protein-protein association network and functional enrichment analyses using Cytoscape (v3.9.1).

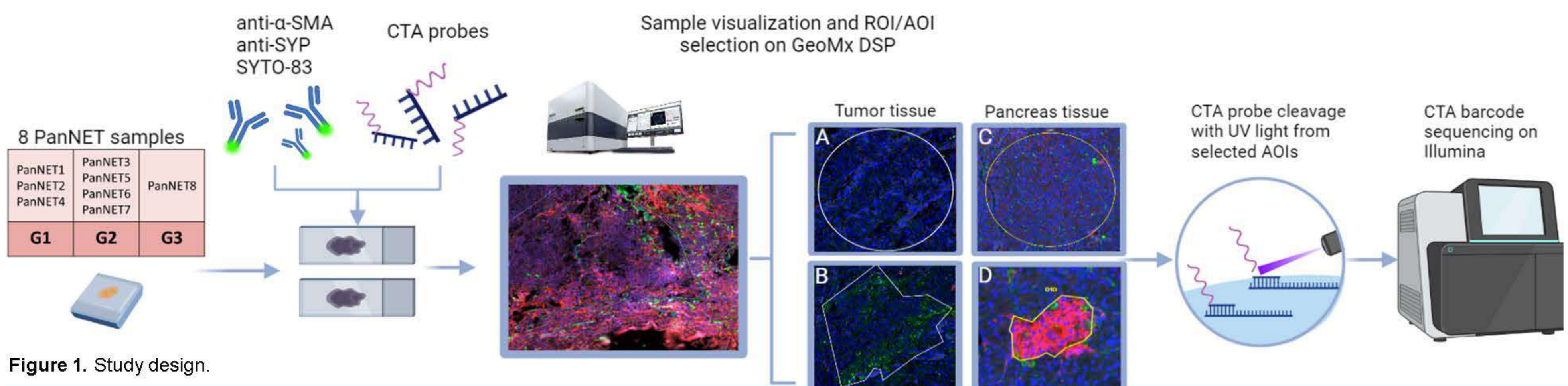


Figure 1. Study design.

## Results

To identify the genes and pathways associated with  $\alpha$ -SMA+ stroma in PanNET tissues we carried out three differential expression analyses where the  $\alpha$ -SMA+ stroma AOIs were compared against tumor, acinar, and islet cell AOIs for each grade separately. Following this we extracted the overlapping DEGs from each scenario which were then subjected STRING database analysis (**Figure 2**). The analysis showed that in all three grades, the  $\alpha$ -SMA+ stroma-associated genes were related to extracellular matrix organization, MET signaling, and immune system-related pathways. Amongst the overlapping DEGs for all three grades, we identified several upregulated collagen genes *COL1A1*, *COL1A2*, *COL3A1*, and *COL5A1* which were the core genes in extracellular matrix organization pathways. We also investigated the expression of several genes encoding CAF secretome-related proteins and found an upregulation of *TGFB1* (TGF- $\beta$ ) and *FN1* (fibronectin 1) across all three grades (**Figure 3**).

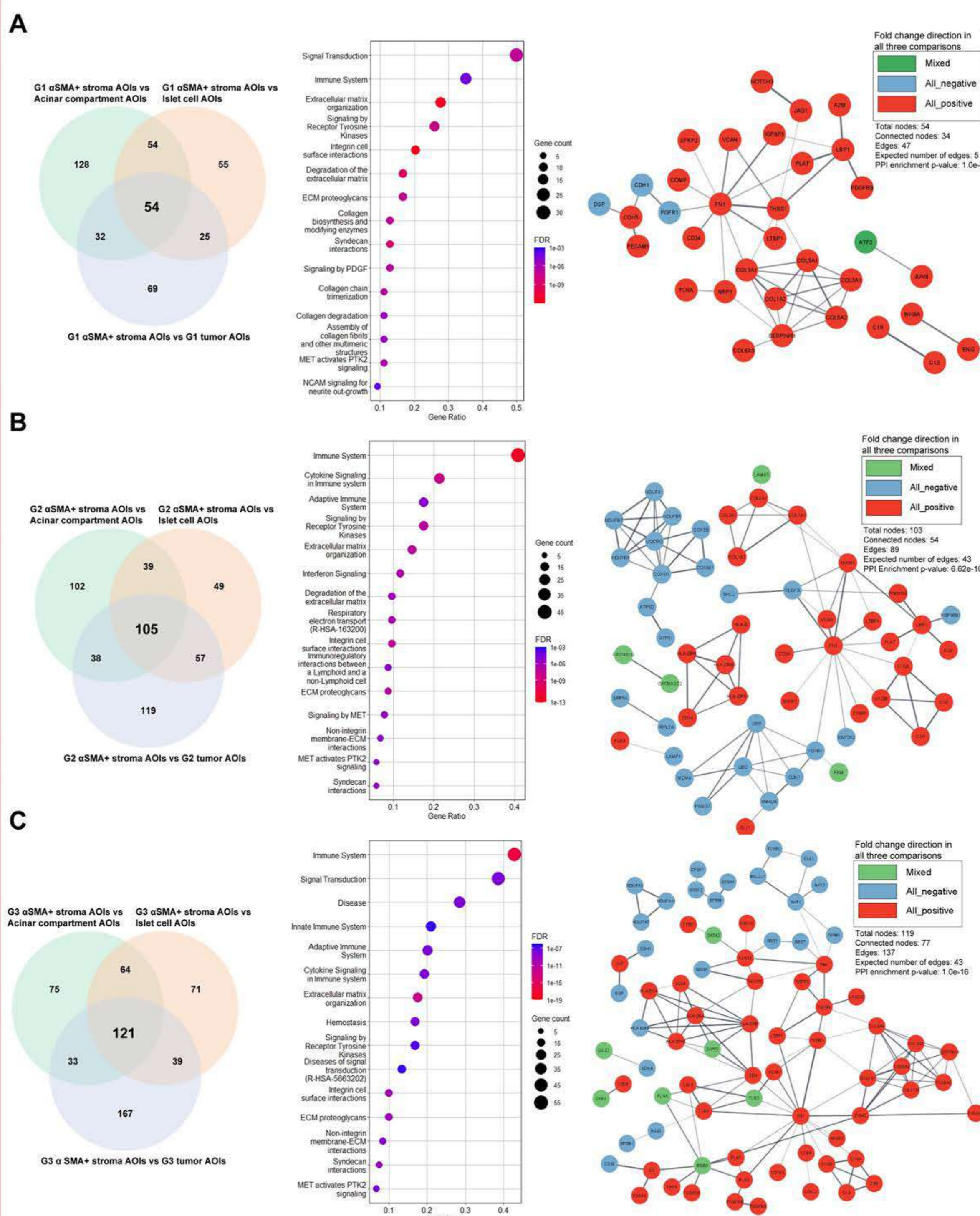


Figure 2. Analysis of  $\alpha$ -SMA+ stroma AOIs. The left-sided figure is a Venn diagram depicting the amount of overlapping DEGs for all three comparisons ( $\alpha$ -SMA+ stroma AOIs vs. tumor/acinar compartment/islet cell AOIs) which were used as an input for STRING protein-protein association and functional enrichment analyses. The middle figure is a dot plot displaying the top 15 overrepresented Reactome pathways according to p-value from STRING functional enrichment analysis. The right-sided figure is a STRING network of physical protein-protein associations. A – G1 tumors, B – G2 tumors C – G3 tumor.

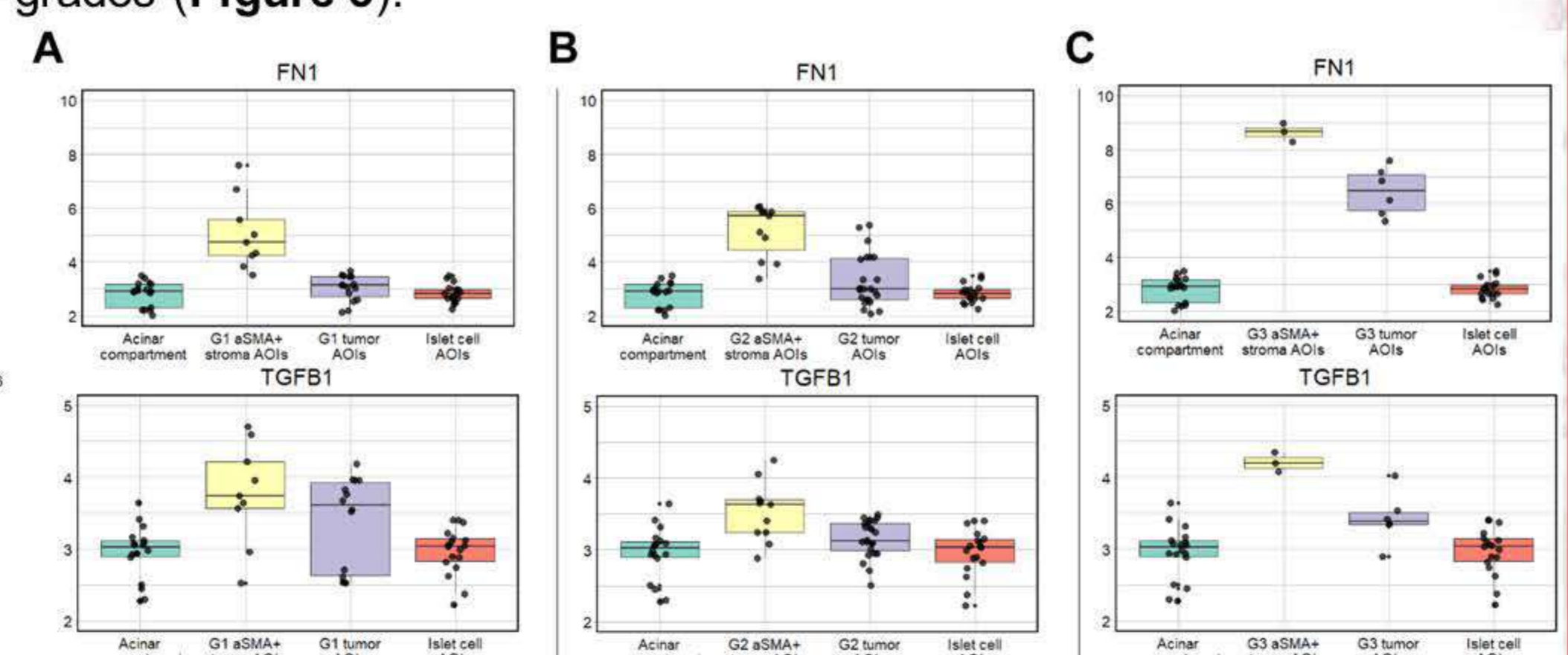


Figure 3. Box plot visualization of genes encoding proteins (*TGFB1*, *FN1*) related to the secretome of cancer-associated fibroblasts. A – G1 tumors; B – G2 tumors; C – G3 tumor. The box plots represent the genes that were differentially expressed in all three comparisons:  $\alpha$ -SMA+ stroma versus 1) tumor, 2) acinar compartment, and 3) islet cell comparisons.

Following the profiling of  $\alpha$ -SMA+ stroma we further investigated the gene expression profiles of tumor cells adjacent and non-adjacent (distant) to  $\alpha$ -SMA+ stromal cells. By comparing the AOIs containing tumor cells adjacent to  $\alpha$ -SMA+ stromal cells against AOIs containing tumor cells non-adjacent to  $\alpha$ -SMA+ stromal cells in differential expression analysis we identified minor changes across all three grades. According to unadjusted p-values the highest level of difference was observed for G1 tumors (**Figure 4A**) where a change in expression was observed for 81 genes (55 upregulated, 26 downregulated in AOIs with tumor cells adjacent to  $\alpha$ -SMA+ stromal cells). For G2 tumors a change was observed in nine genes (**Figure 4B**). As for the G3 tumor, a change was observed in 16 genes (**Figure 4C**). Interestingly, in the G3 comparison, the most dysregulated gene (*MMP9*) was the only gene with a q-value < 0.05.

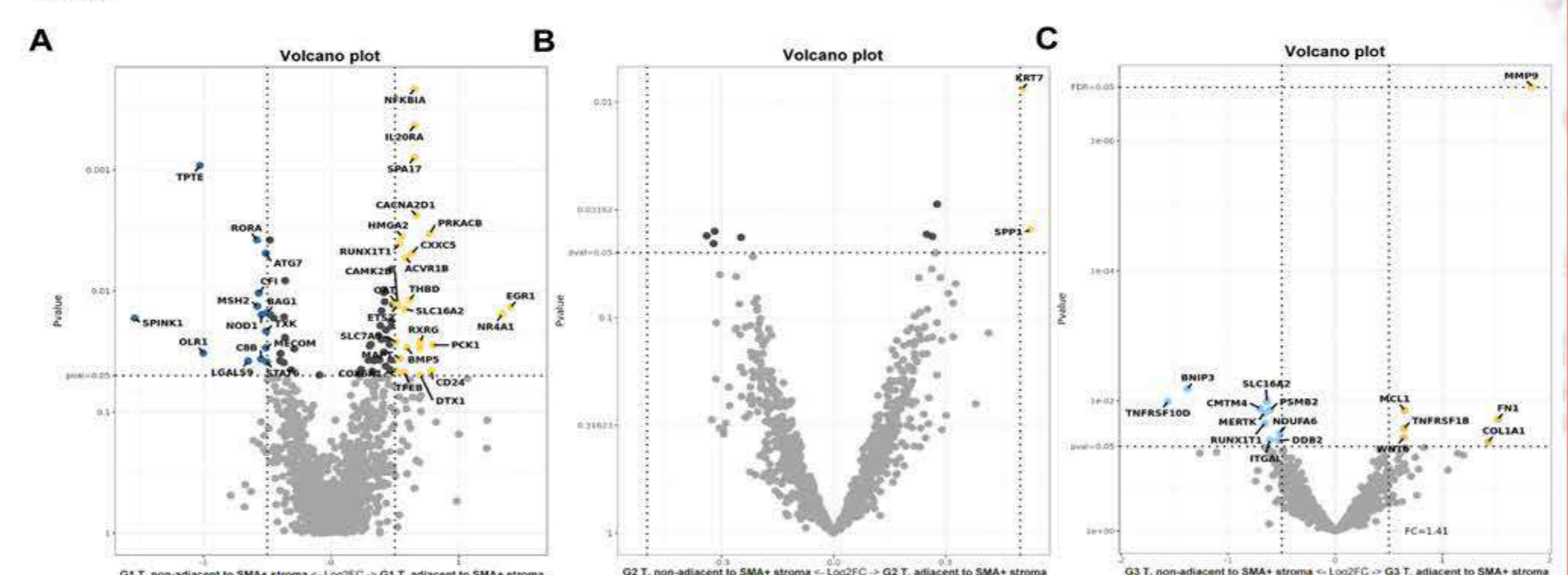


Figure 4. Volcano plots depicting the  $\log_2$ FCs (X axis) and p-values (Y axis) from the results of differential expression analyses where we compared the AOIs containing tumor cells immediately adjacent to  $\alpha$ -SMA+ stromal cells vs. AOIs containing tumor cells non-adjacent (distant) from  $\alpha$ -SMA+ stromal cells. A – G1 tumors, B – G2 tumors, C – G3 tumor.

## Conclusions

PanNET stroma overexpresses *COL1A1*, *COL1A2*, *COL3A1*, *COL5A1*, *TGFB1*, and *FN1* across all three grades warranting of these markers in context of stromal therapeutic targets and prognostic markers. Furthermore the differences in gene expression profiles between tumor cells immediately adjacent to  $\alpha$ -SMA+ stromal cells versus stroma non-adjacent (distant) tumor cells indicate a **potential crosstalk between stromal cells and tumor cells**.

## Acknowledgements

This study was supported by an internal grant of Pauls Stradins Clinical University Hospital: „Pankeātisko neiroendokrīno audzēju prognostiskas marķieru un terapijas mērķu identifikācija (Pancreatic neuroendocrine tumor prognostic and therapeutic target identification)”. This study was also implemented thanks to the support of patron SIA «Mikrotīkls», donation was administrated by University of Latvia Foundation. We also acknowledge the Genome Database of Latvian population, Latvian Biomedical Research and the Study Centre, and Ramón y Cajal Health Research Institute (IRYCIS) for providing data and biological samples.



# State support for micro-enterprises in their early stages in Latvia

Ilona Beizitere \*

PhD student, Latvia University of Life Sciences  
and Technologies



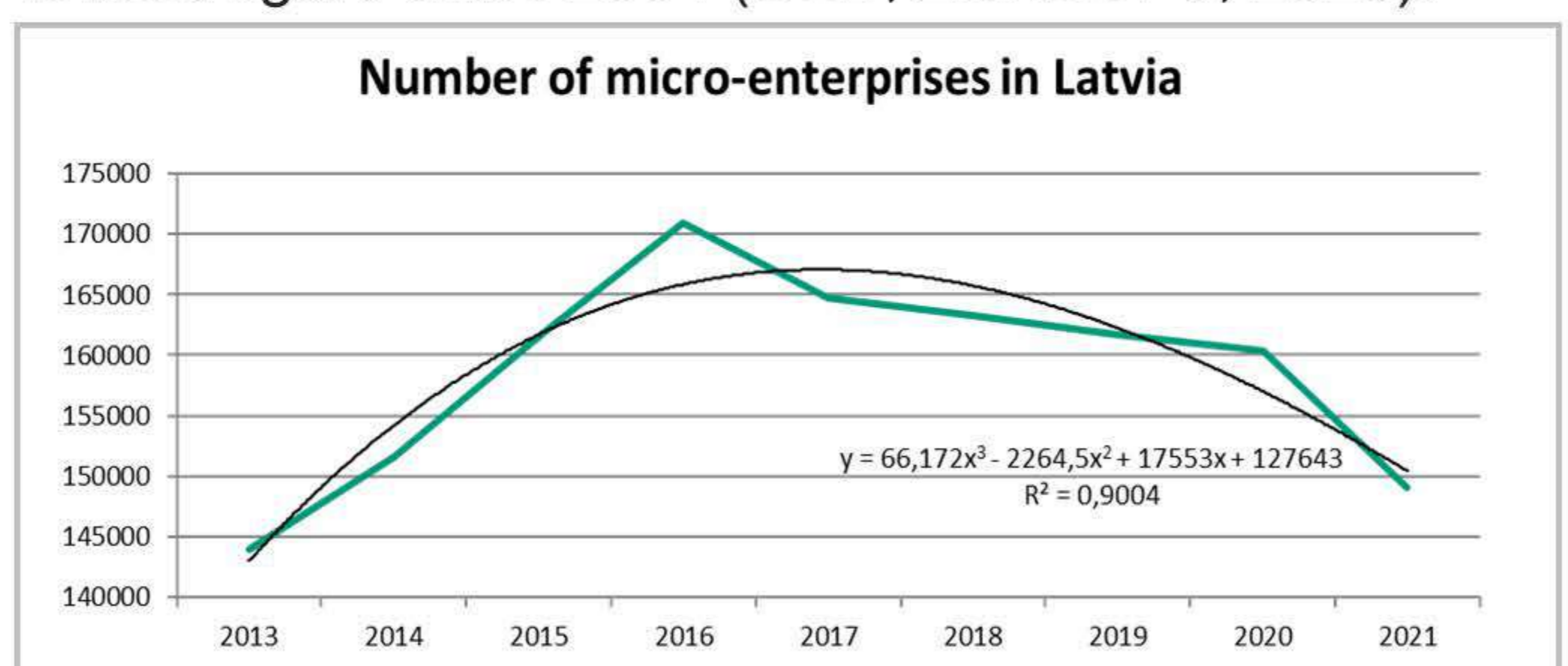
## Introduction

Micro-enterprises in the early stages of their development (start-ups) have a significant positive economic effect: they create jobs, increase productivity and a high export ratio. Innovative companies contribute to competitiveness and the growth of the national economy. Latvia's economy is largely based on the performance of micro-enterprises (as the smallest enterprises according to the EU definition), which make up approximately 93% of all Latvian enterprises. The study based on methods: Analysis of scientific literature; regulatory framework; statistical data analysis; interviews with experts on state support for companies; two surveys of enterprises in Latvia – carried out in the pre-crisis period and in the COVID-19 period.

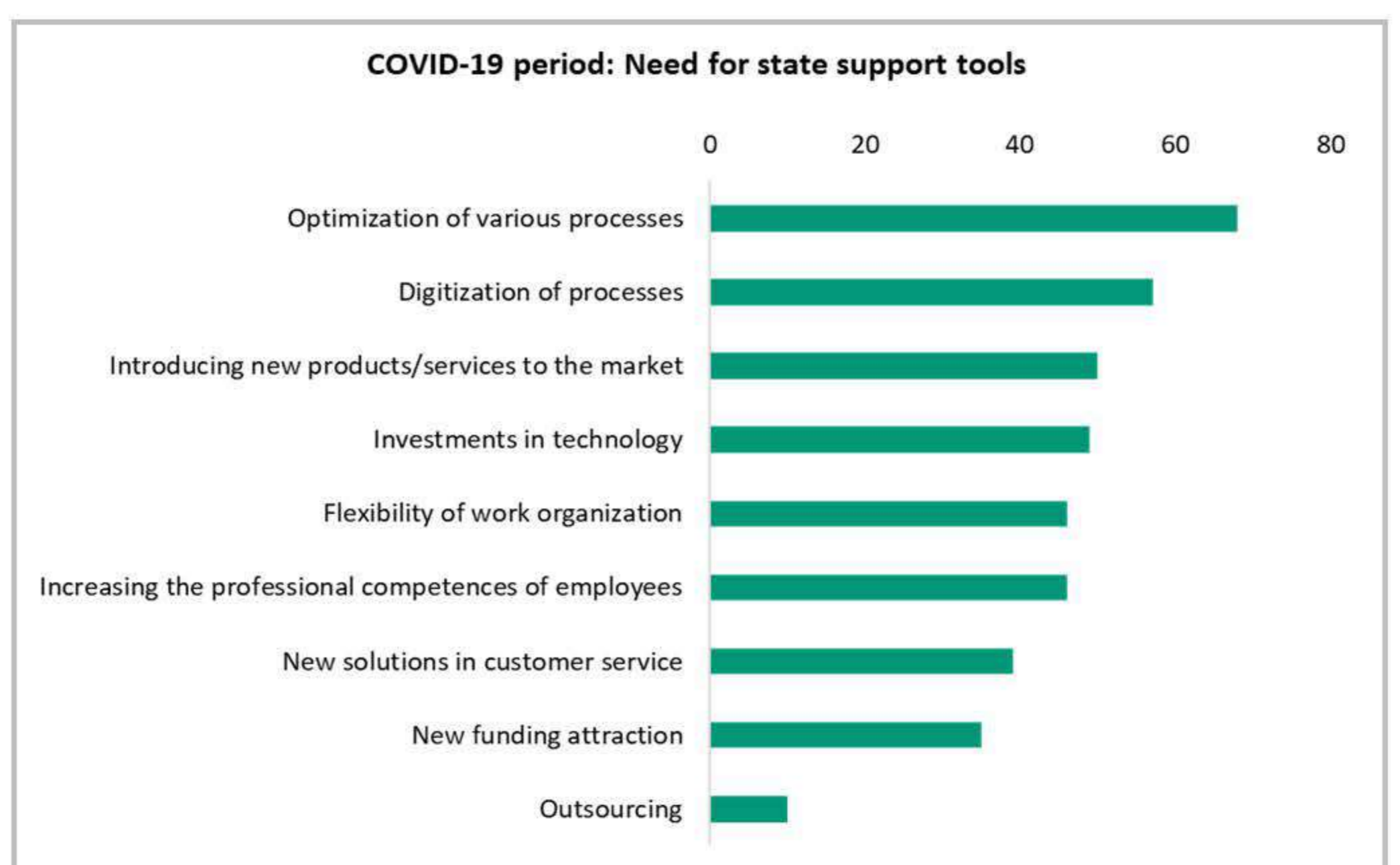
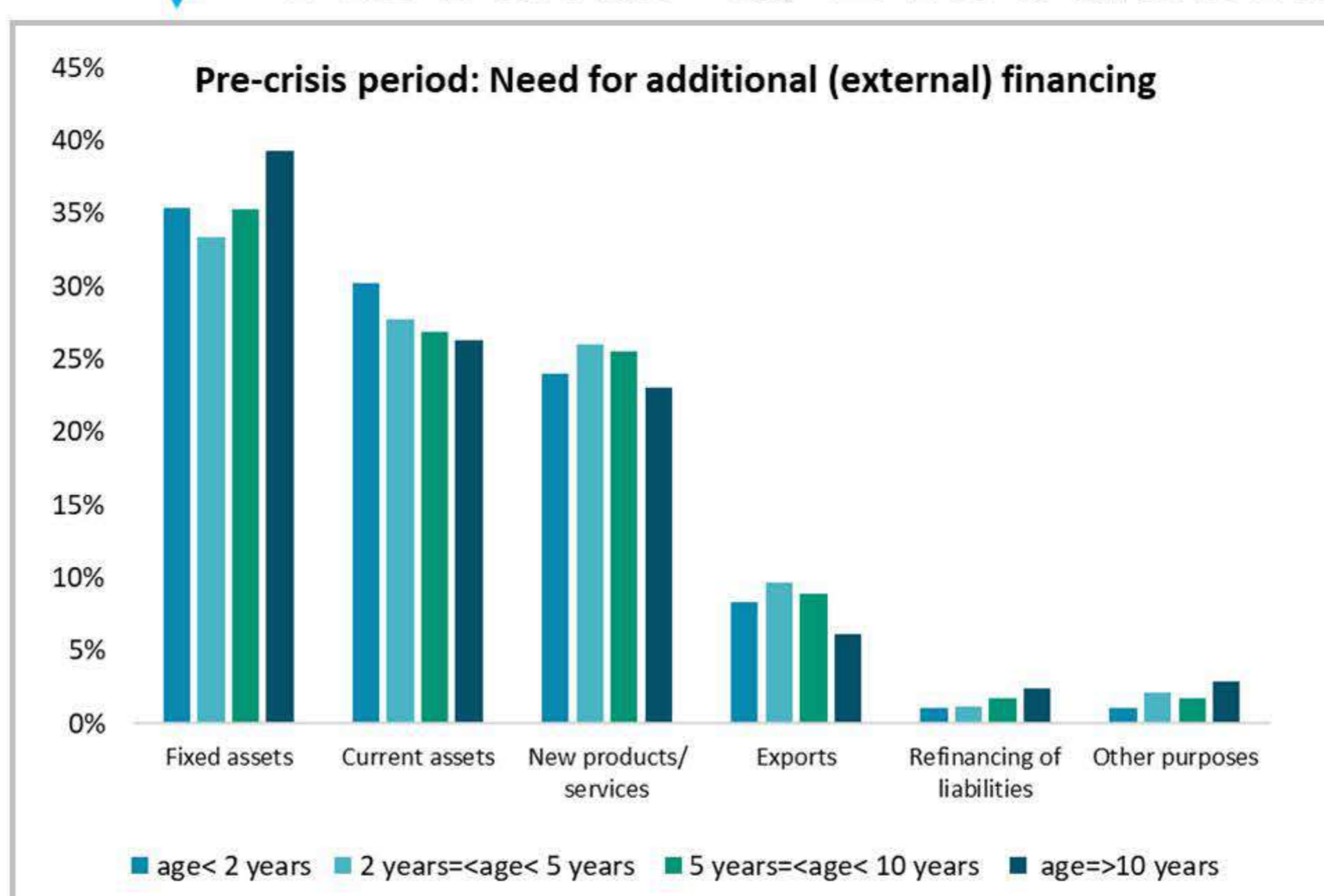


## Research Objective

To find out the forms and instruments of state support for micro-enterprises in the early stages of their development, in order to develop recommendations for improving the current state support scheme. The decrease in the number of micro-enterprises already in the pre-COVID-19 crisis period raises concerns about the successful development of companies in Latvia. In 2022, only 8,826 new companies were registered in Latvia, which is the lowest figure since 2004 (CSB, LURSOFT, 2023).




## Results & Discussion



In the pre-crisis period, access to finance was the main factor limiting development for 46% of start-ups. Financial support was needed for fixed and current assets and for new products or services. During the crisis, only a small part of micro-enterprises (16%) had used the support measures offered by the state. The development of start-ups requires: support for process optimization and digitization, investments in new products, services and technologies. Scientific literature confirms that digitization is essential for the development of micro-enterprises. However, the implementation of the digitization process is affected by factors – insufficient digital competences of employees, lack of IT specialists, insufficient resources for technologies and for staff training, ensuring the safety of internet environment and clarity of legislation on business digitalization. A large part of start-ups needs could be solved with state aid funding.



## Conclusions

1. In Latvia, new companies are offered various types of support, including before company registration.
2. Despite the efforts of Latvian politicians to improve the availability of state aid for companies, including support for micro-enterprises in their early stages, there have been few targeted measures and their opportunities have not always achieved the intended goals.
3. It should be noted that financing models for micro-enterprises (particularly for start-ups) are different from models intended for larger SMEs.
4. In order to promote digitalization, politicians should take into account the complex nature of business support: the actual needs of micro-enterprises and also the indirect factors affecting the implementation of digitalization processes.



## Contact Information

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\* Acknowledgements to Biruta Sloka (Dr.oec./Prof./ University of Latvia), Ieva Brence (Dr.sc.administr./Assoc. prof./ Turība University) and Julija Bistrova (Dr.oec./Assoc.prof./ Rīga Technical University) for their help in preparing the research.

# The Importance of Accurate Bacterial Quantification in Blood Microbiome Studies: Insights from Disease Association study

Dāvids Fridmanis<sup>1</sup>, Nikita Fomins<sup>1</sup>, Dita Gudrā<sup>1</sup>, Maija Ustinova<sup>1</sup>, Ance Roga<sup>1</sup>, Kristīne Vīksne<sup>1</sup>, Inese Poļaka<sup>2</sup>, Reinis Vangravs<sup>2</sup>, Marcis Leja<sup>2</sup>.

<sup>1</sup>Latvian Biomedical Research and Study Centre; <sup>2</sup>UL Institute of Clinical and Preventive Medicine.

## Introduction

For decades blood has been considered as microbiologically sterile environment. However small number of researchers have also reported that microbes are found in the blood. Recent massive parallel sequencing and quantitation-based studies have confirmed that bacterial DNA can indeed be found in the blood of both healthy and diseased humans and its primary sources are intestinal tract, mouth and skin. The recent findings in this field indicate that the alterations in blood microbial population structure are significantly associated with various diseases. However, such studies are prone to significant contamination in all key stages from sample collection to Nucleic acid extraction and DNA analysis. Therefore application and development of proper contamination control mechanisms is of paramount importance.

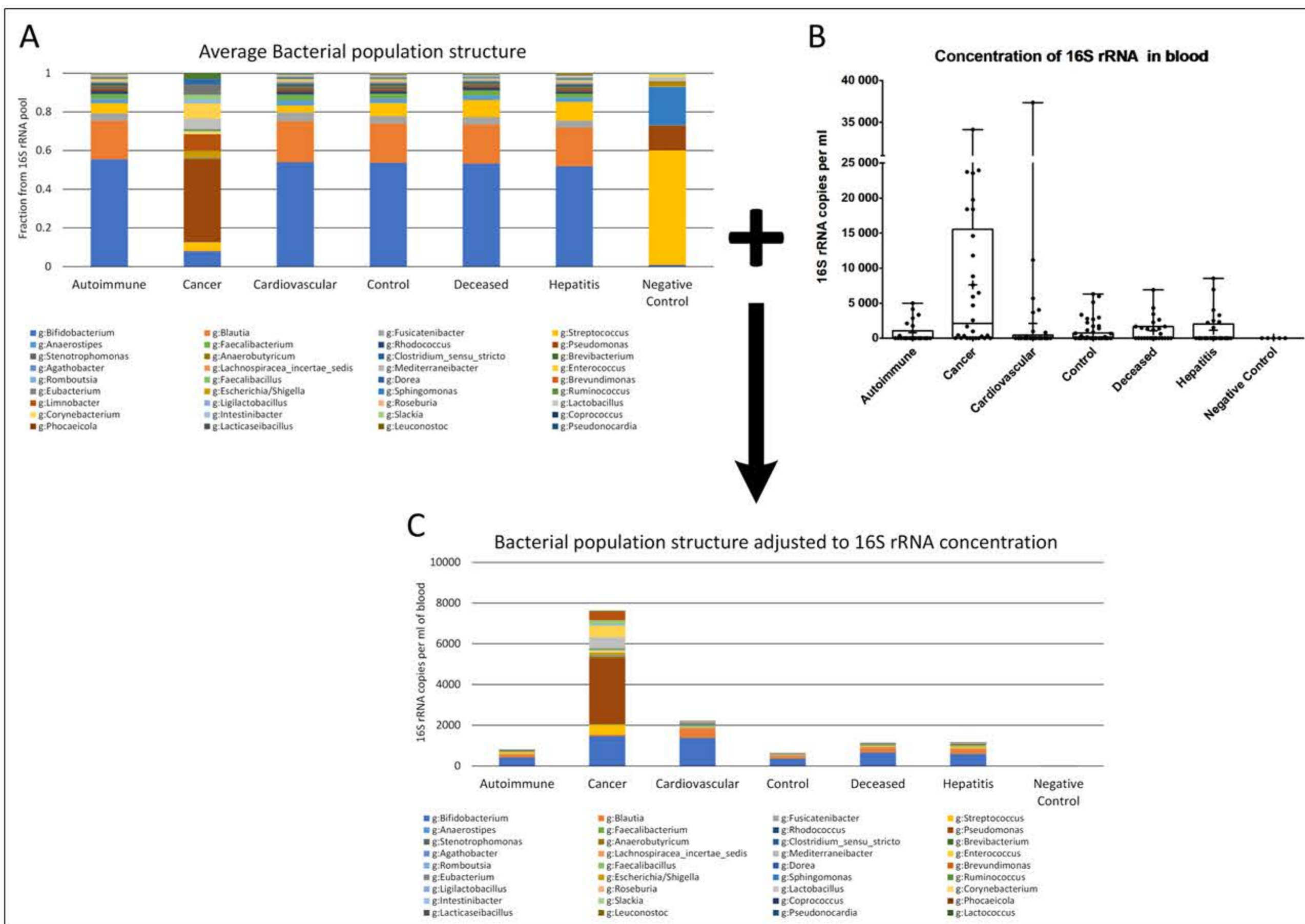
## Research Objective

The goal of this study was to investigate alterations of blood microbiome in participants that have suffered from 1) hepatitis C virus infection and 2) cardiovascular diseases, are suffering from 3) autoimmune diseases and 4) colorectal cancer or 5) died within five years after sample collection as well as to estimate the potential of concentration based contamination control.



The art was generated by Hotpot AI

## Results & Discussion



The highest average concentration of 16S rRNA gene was detected in cancer group, while the concentration within extraction negative control samples was even lower. However, Mann-Whitney U test uncovered that significant were only those differences that involved cancer group. (Fig. 1B)

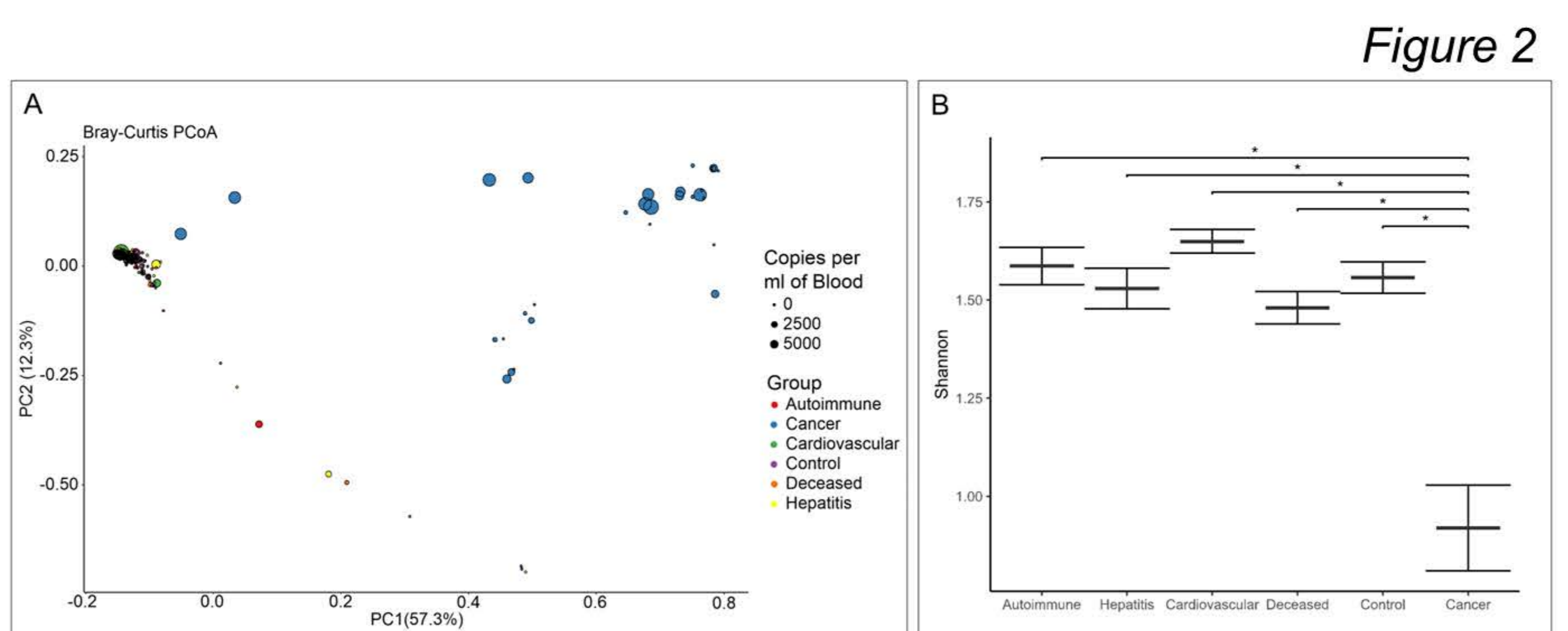
Shannon index of samples from the cancer group was significantly ( $p < 0.05$ ) lower than that of the other study groups (Fig. 2B) while in Bray-Curtis dissimilarity plot samples of the cancer group were forming two separate rather wide clusters that did not overlap with the densely packed cluster, which was formed by samples from groups. (Fig. 2A)

All extraction negative control samples generated sequencing data (Fig. 1A), but combination with quantitation data allowed to negate this effect (Fig. 1C).

## Conclusions

Acquired results revealed that blood microbiome of cancer patients significantly differs from that of healthy individuals and individuals that suffered from other studied diseases.

Quantitation of microbial DNA within low bacterial biomass samples and combination of such data with population structure data provides means for contamination control.



## Contact Information

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# Virome of grapevines grown in Latvia detected by next generation sequencing

Authors: Rebeka Ludviga, Nikita Zrelavs, Ieva Kalnciema, Gunta Reševica, Santa Pikure, Andris Dišlers, Ina Baļķe

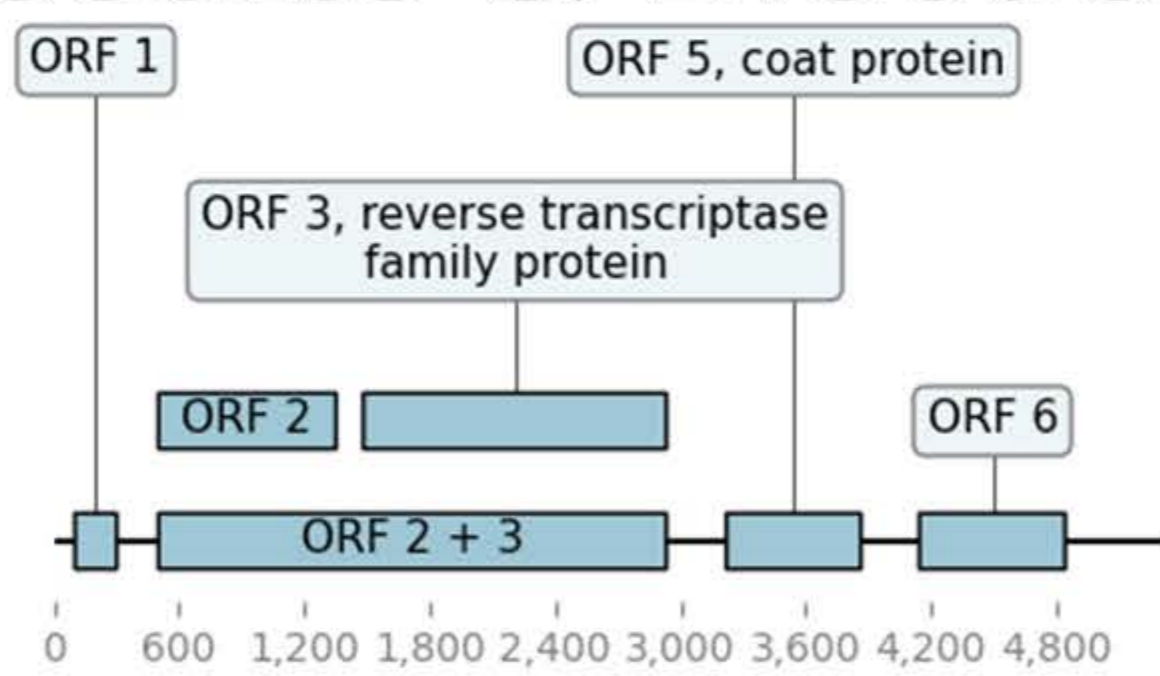
Latvian Biomedical Research and Study Centre, Rātsupītes 1, k-1, Riga LV-1067, Latvia

## Introduction

Due to global climate change, the average annual temperature of Latvia has risen, leading to better conditions for grapevine growing. For a better grapevine selection process, it's important to acquire data about grapevine virus incidence in Latvia, as prevention so far is the only cure for plant viruses.

There are no previous studies carried out on grapevine virome in the territory of Latvia, thus we did a screening experiment on four grapevine varieties («Krasa Severa», «Pink Reliance», «Supaga» and «Zilga») using NGS.

## Results & Discussion

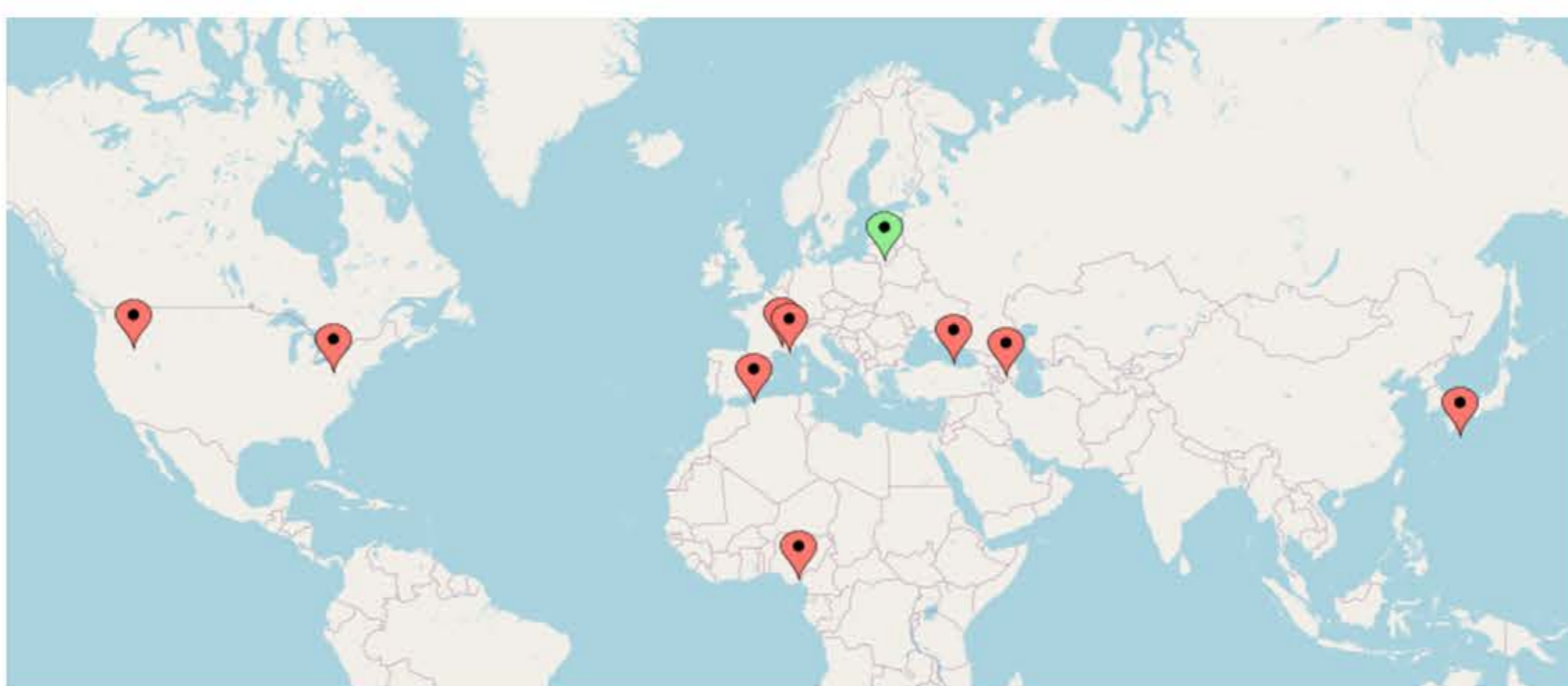


Above: possible open reading frames (ORF), identified by CDD. Reverse transcriptase family protein domain hit with accession no. cl02808 and coat protein with accession no. cl29941

On the right: outgroup (*Umbravirus*) rooted maximum-likelihood *Procedovirinae* phylogenetic tree. Tips labeled «accession number | virus name | genus» and are colored on the basis of the genera to which the virus belongs to.

Grapevine emaravirus A was found in grapevine varieties «Zilga» and «Supaga». Grapevine associated tymo-like virus was found in all four grapevine varieties. In variety «Pink Reliance» additional three viruses were found - grapevine fleck virus, grapevine leafroll associated virus 1 and grapevine rupestris stem pitting associated virus, but in variety «Krasa Severa» also *Vitis cryptic virus* was found.

Below: the geographic spread of closest related Grapevine leafroll associated virus 1 isolates. Only isolates above 85% identity with our sequence were included, and of these isolates those without any or with vague geolocation data were excluded, leaving 13 isolates of which 4 locations had more than one isolate.



## Conclusions

This early experiment could be the start of a larger scale grapevine sequencing project in Latvia, as more novel viruses could be discovered and a database of grapevine virome could be created, identifying the most threatening species, creating new field tests for imported plants and allowing agriculturists to create hardier breeds.

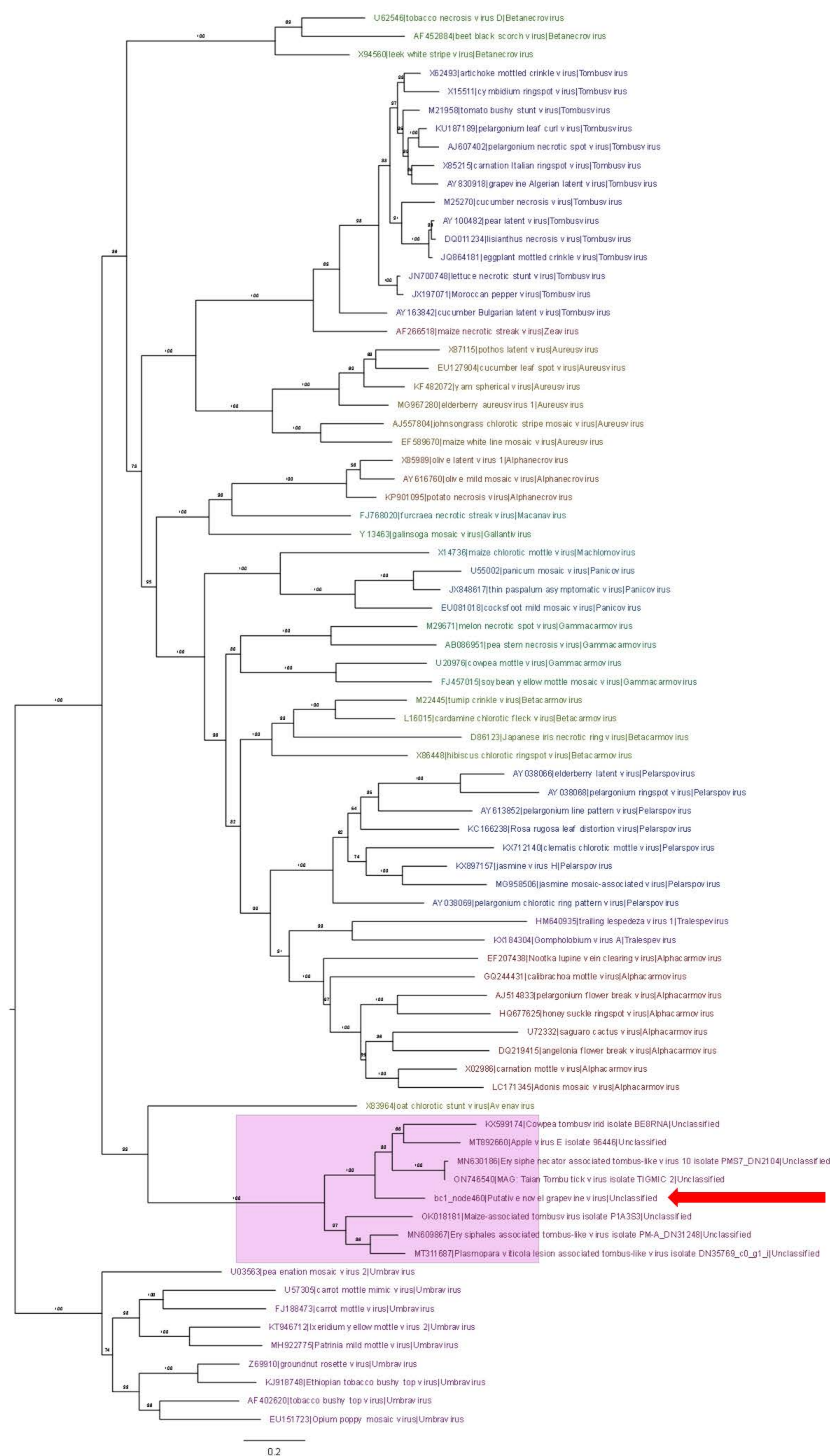
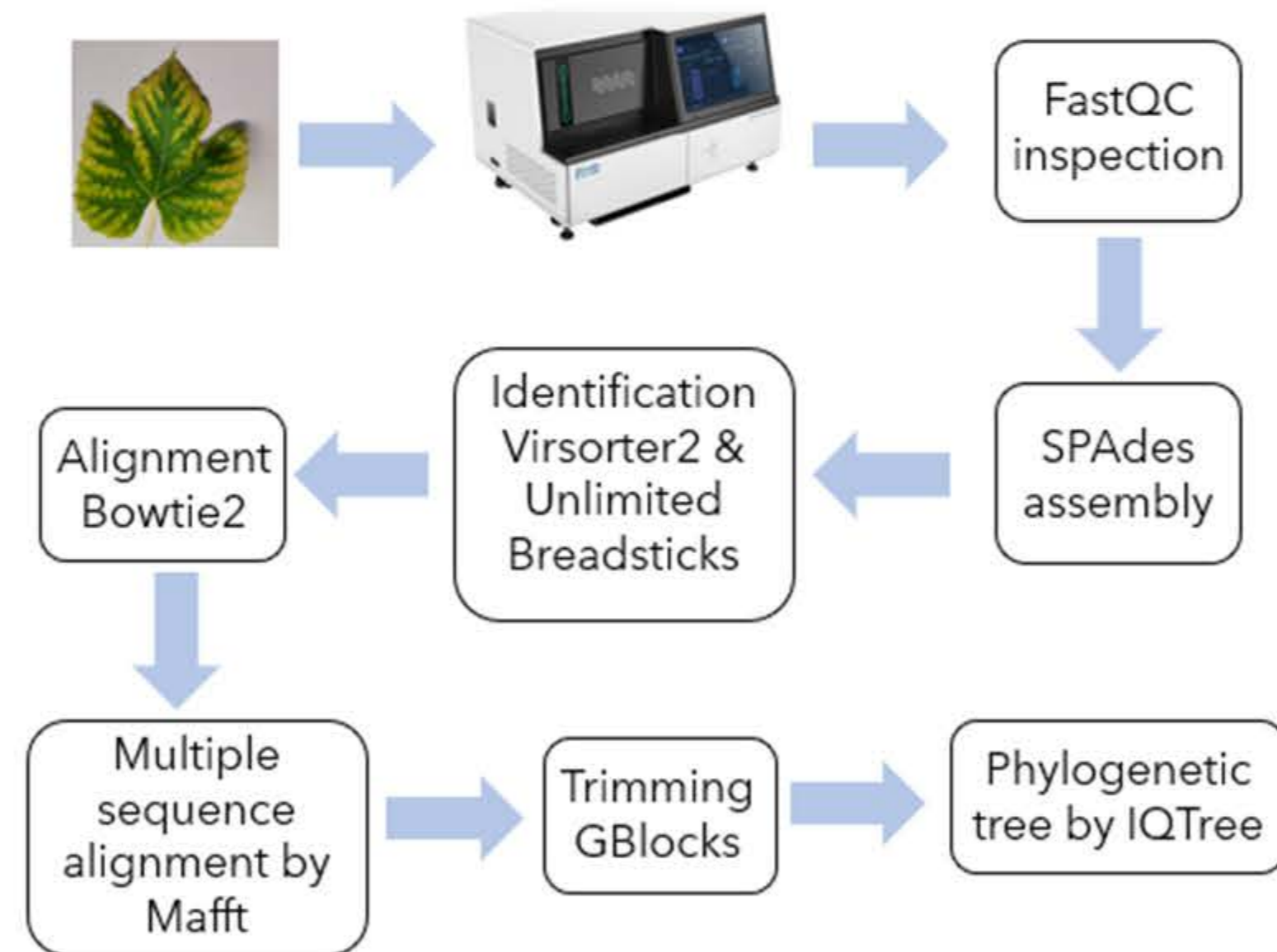
## Contact Information

Project funded by ESF project "Strengthening of the Capacity of Doctoral Studies at the University of Latvia within the Framework of the New Doctoral Model", identification No. 8.2.2.0/20/I/006.

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## Research Objective

The objective of this project is to characterize common virus species found among grapevines grown in the territory of Latvia, and also identify potential new viruses through sequence analysis and phylogenetic reconstruction.





## Reģionālā attīstība Latvijā valsts drošības jautājuma kontekstā

Dr.oec. Modriete Peļše, Ilgmārs Lejnīeks Latvijas Biozinātņu un tehnoloģiju universitātē

### Ievads

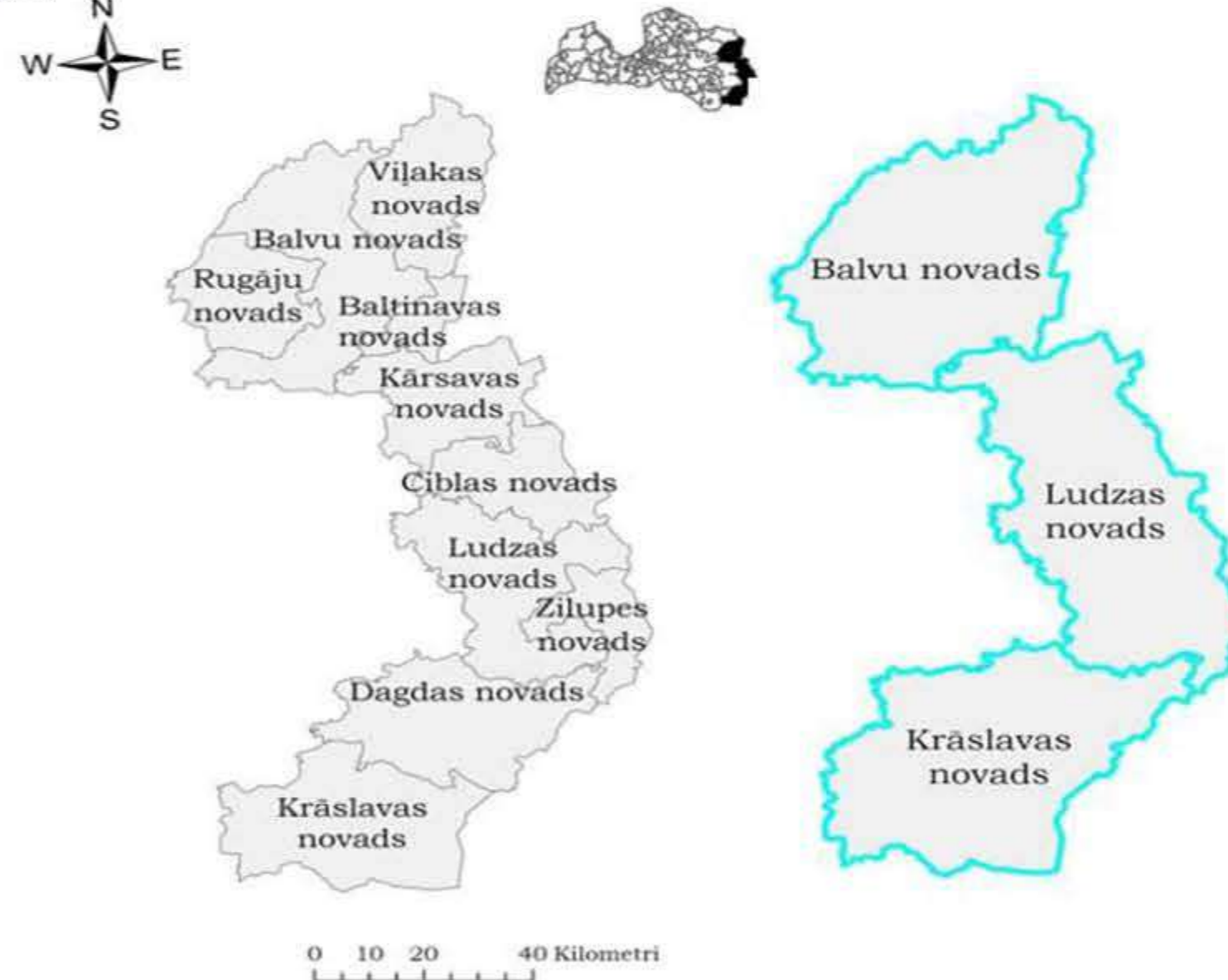
Pēdējos gados par drošības jomu, plašākā tās izpratnē, saistīti jautājumi ir aktualizēti nacionālā un reģionālā līmeņa attīstības politikas plānošanas dokumentos. Savukārt vietējo pašvaldību politikas plānošanas dokumentos un realitātē šiem jautājumiem ir bijusi pievērsta maza uzmanība. Kaut gan Latvija ir ES un arī NATO valstu savienības ārējā robeža.

Vienlaicīgi notiek strauja iedzīvotāju skaita samazināšanās pierobežu pašvaldībās Latvijā un ekonomisko rādītāju atpalcību šajās teritorijās, kas ir papildu drauds valsts drošībai ne tikai politiskajā, bet arī ekonomiskajā jomā. Arī digitālo rīku izmantošanas iespējas šeit ir ierobežotas. Digitālās tehnoloģijas, to lietošanas prasme vienlaicīgi var būt gan patiesas, gan melīgas informācijas avots. Tas nenodrošina kritisku informācijas izvērtēšanas iespēju ikdienas lietotājam, ja tāda nav apgūta.

Saistībā ar Krievijas agresiju Ukrainā Latvijas pierobežā ir izveidojusies saspīlētā ģeopolitiskā situācija, kas samazina arī iespējas piesaistīt privātos investorus šīm teritorijām.

### Pētījuma mērķis

Pētījuma mērķis ir novērtēt Austrumu pierobežas novadu ekonomiskās attīstības potenciālu un perspektīvas ģeopolitiskā apdraudējuma kontekstā Latvijā.



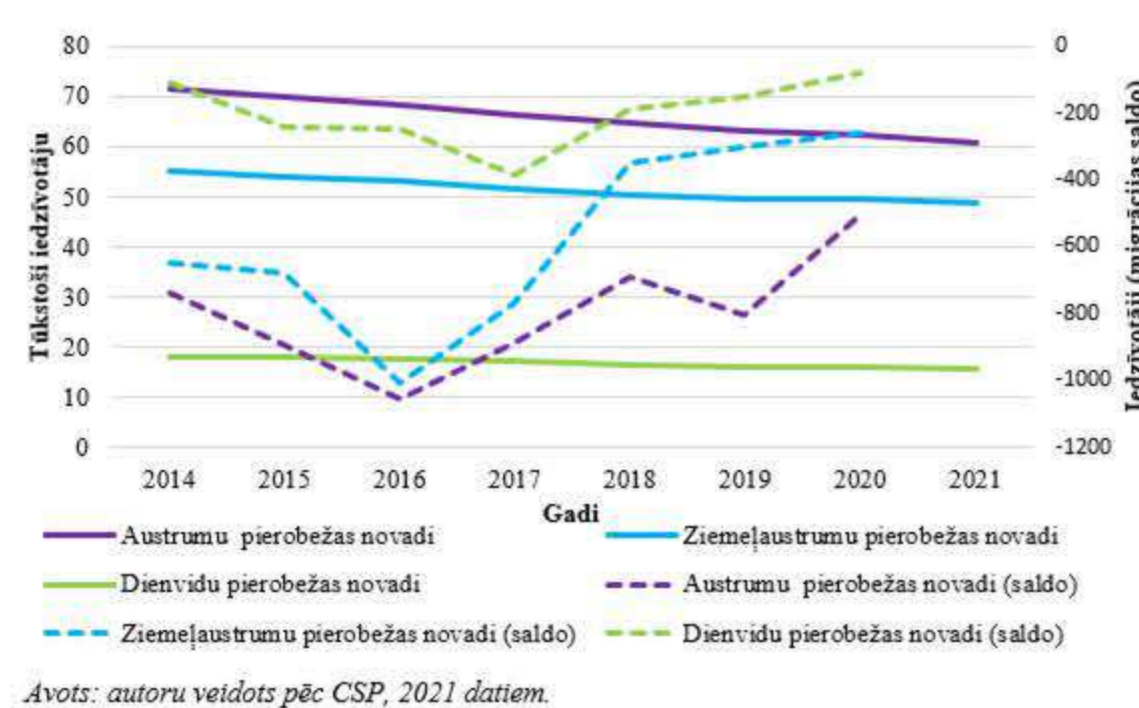
Austrumu pierobežas novadi, kuri robežojas ar Krieviju un Baltkrieviju, pirms un pēc Administratīvi teritoriālās reformas Latvijā 2021.gada 1.jūlijā

### Rezultāti un diskusija

Ar drošības jomu saistītu tēžu lietojums vidēja termiņa Latvijas attīstības politikas plānošanas dokumentos kopš 2014.gada

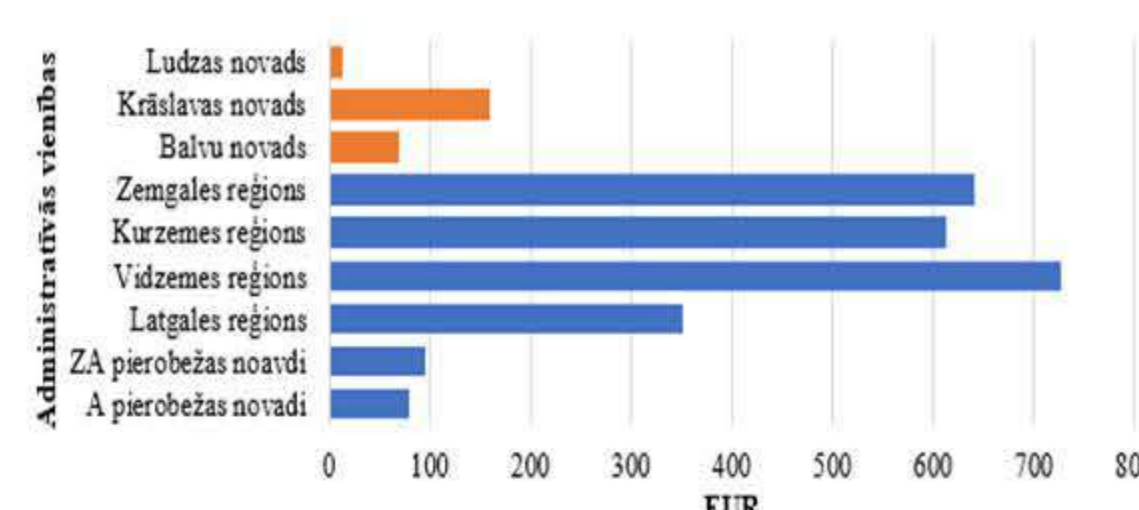
Politikas plānošanas dokuments	Drošība	Apdraudējums	Ģeopolitika	Krievija	Baltkrievija	Civīlā aizsardzība
Nacionālais attīstības plāns 2014.-2020.gadam	9	3	0	0	0	0
Nacionālais attīstības plāns 2021.-2027.gadam	53	14	1	1	0	1
Latgales programma 2010. – 2019.gadam	13	1	0	18	15	0
LPR attīstības programma 2021. – 2027.gadam	28	4	0	19	12	0
Balvu novada attīstības programma 2018. – 2024.gadam	13	3	0	6	0	2
Balvu novada attīstības programma 2022. – 2027.g.	9	4	0	14	0	2
Ludzas novada attīstības programma 2018. – 2024.gadam	15	0	0	15	4	0
Ludzas novada attīstības programma 2021. – 2027.g.	11	4	0	23	7	10
Krāslavas novada attīstības programma 2019. – 2025.gads	22	3	0	27	45	12
Krāslavas novada attīstības programma 2022. – 2028.gads	17	5	0	7	35	10

Avots: autoru veidots



Avots: autoru veidots pēc CSP, 2021. datiem.

Iedzīvotāju skaita dinamika un migrācijas saldo Latvijas novadu grupās 2014. – 2021.gadam



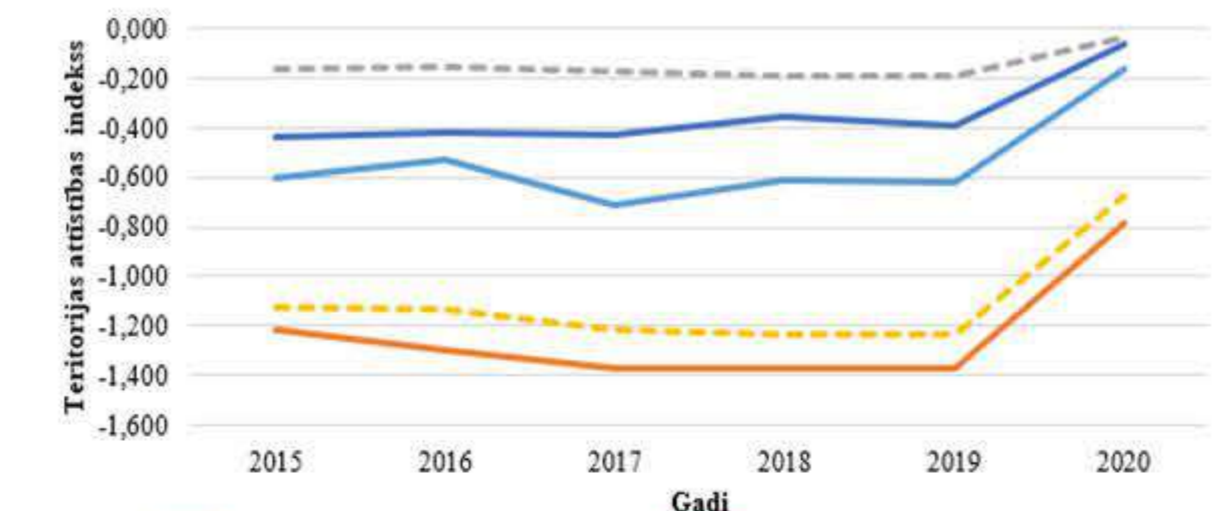
Avots: autoru veidots pēc VRAA, 2021. datiem

Ārvalstu tiešo investīciju ieguldījumu kopsumma uz vienu iedzīvotāju Austrumu un Ziemeļaustrumu pierobežas novados, Latvijas reģionos 2014.-2019.gadā, eiro

Latvijas un pierobežas novadus raksturojošie sociālekonomiskie rādītāji 2020. un 2021.gadā

Pēc administratīvi teritoriālās reformas (no 01.07.2021.)	Pirms administratīvi teritoriālās reformas (līdz 01.07.2021.)	Iedz. skaits (2021.)	Iedz. blīvums uz 1 km² (2020.)	Darba spējas vecuma iedz. īpatsvars, % (2021.)	Bezdarba līmenis, % (2021.gada jūnijs)	Aktīvo uzņēmumu skaits uz 1000 iedz. (2020.)	Vidējā darba alga, bruto, EUR (2020.)
Balvu novads	937	5	68,0	13,1	89	687	
Balvu novads	11576	11	62,7	10,7	84	721	
Rugāju novads	2026	4	65,1	9,4	127	655	
Vilakas novads	4476	7	64,4	12,3	78	711	
Dagdas novads	6475	7	64,6	14,4	88	645	
Krāslavas novads	13533	14	61,4	12,9	64	726	
Ciblas novads	2362	5	66,3	23,1	84	715	
Kārsavas novads	5127	8	64,6	18,6	72	740	
Ludzas novads	11739	13	63,0	17,6	63	774	
Zilupes novads	2549	9	64,4	19,9	50	552	
Latvija	189223	31	61,9	5,8	90	1 143	

Avots: autoru veidots, izmantojot CSP, 2021 un NVA, 2021. datus.



Avots: autoru veidots pēc VRAA, 2021. datiem.

Teritorijas attīstības indekss Latvijā, Latgales reģionā un pierobežas novadu grupās 2015. – 2020.gadam

### Digitālo rīku pieejamība un interneta pieslēgums:

- Ievērojami uzlabojumi pēdējo 10 gadu laikā Austrumu pierobežas teritorijās interneta pārklājuma pieejamībā un datorprasmju jomā, ja 2010.gadā Latgales reģionā 1/3 mājās saimniecībās tika uzskatīts, ka pārāk dārgas ir iekārtu un interneta izmantošanas piekļuves izmaksas, tad 2019.gadā vairs tikai 5% mājās saimniecību, tas sagādā problēmas. Šajās teritorijās ir ievērojami lielāks skaits mājās saimniecību 14%, kuri uzskata, ka viņiem internets vispār nav nepieciešams.
- Internets regulāri tiek lietots 83,7% (2022.gada dati) Latgales reģiona mājās saimniecībās, salīdzinoši Pierīgas reģionā 91,8%, bet datoru nekad nav lietojuši 15% mājās saimniecību pārstāvji, kas salīdzinoši ar citiem reģioniem ir lielāks rādītājs. LV oficiālā statistikas datu bāzes informācija. Pieejama: [https://data.stat.gov.lv/pxweb/lv/OSP\\_PUB/START\\_IKT\\_DL\\_DLM/](https://data.stat.gov.lv/pxweb/lv/OSP_PUB/START_IKT_DL_DLM/)

### Secinājumi

- 2019.gadā apstiprinātajā Nacionālās drošības koncepcijā norādīts uz nepieciešamību pierobežas pašvaldībām kritiski izvērtēt pārrobežu sadarbību ar Krieviju un Baltkrieviju, kas var pastiprināt valsts drošības apdraudējumu, tomēr Latvijas teritorijas attīstības politikas plānošanas dokumentos nav akcentēts ģeopolitiskās situācijas radītais apdraudējums, lai gan lielākā daļa no šiem plānošanas dokumentiem pieņemta vairākus gadus pēc 2014.gada notikumiem Ukrainā.
- Neskatoties uz ilgstoši saspīlētām attiecībām starp Latviju un Krieviju, Latgales reģiona un Austrumu pierobežas pašvaldību attīstības plānos tika izvirzīti mērķi, kas bija saistīti ar pārrobežu sadarbības attīstību un starptautisko komercpārvadājumu apjoma palielināšanu, kā vienu no nozīmīgākajiem labklājības nodrošināšanas aspektiem pierobežas novados.

- Laika periodā no 2014. līdz 2021.gadam Austrumu pierobežas novados iedzīvotāju skaits samazinājies par 15%, bet Latvijā kopumā par 5%, darbaspējas vecuma iedzīvotāju skaits attiecīgi samazinājās par 14% un 6%. Kopumā šīs abas sabiedrības grupas ir savstarpēji atkarīgas, līdz ar to ietekmē patēriņu, publisko pakalpojumu efektivitāti un vietējo tirgu šajās teritorijās.
- Vienlaicīgi iedzīvotāji pierobežā ir teritorijas «acis» un «ausis». Zemais teritorijas attīstības indekss norāda uz 8 nozīmīgu ekonomisko rādītāju (ekonomiski aktīvi uzņēmumi, bezdarba līmenis, iedzīvotāju ienākuma nodokļa apmērs, ilgtermiņa migrācijas saldo, iedzīvotāji virs darbaspējas vecuma, trūcīgo iedzīvotāju īpatsvars, noziedzīgo nodarījumu skaits, dabiskais iedzīvotāju saldo) atpalcību Latgales reģiona pašvaldībās kopumā, un ja tiek skatīti tieši Austrumu pierobežas novadi, tad teritorijas attīstības indekss ir viszemākais visā Latvijā, sasniedzot – 1,4 2017. līdz 2019.gadam, kopš 2020.gada situācija nedaudz ir uzlabojusies.
- ES fondu finansējums ir svarīgs investīcijas Latvijas attīstībā, taču Austrumu pierobežas pašvaldības uz vienu iedzīvotāju ES fonda līdzekļus iepriekšējā plānošanas periodā piesaistīja par 24% mazākā apmērā nekā, vidēji Latvijas pašvaldības.



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# Bacteriophage-derived double-stranded RNA like Poly IC activates IFN signaling and possesses the antiviral properties

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<sup>3</sup>Riga Stradiņš University, Riga, Latvia

## Introduction

Bacteriophage-derived double-stranded RNA, also known as Larifan (Larifan Ltd., Riga, Latvia), is a nationally well-known antiviral medication. It is obtained biotechnologically from *E. coli* cells infected with f2sus11 amber mutant bacteriophage and comprises dsRNA molecules (*acidum ribonucleicum duplicatum*). It has been developed as a poly-functional and wide-spectrum antiviral drug that is a potent inducer of endogenous type I interferons (IFNs).

Currently, Larifan is approved and registered for human use at the State Agency of Medicines of the Republic of Latvia as a treatment method for herpes virus infections and secondary immunodeficiency (Reg. No.04-0230). Polyriboinosinic:polyribocytidylic acid (poly[I:C]) is a synthetic dsRNA that mimics the effects of naturally occurring dsRNA. For decades, poly(I:C) has been extensively investigated for its immune-stimulatory properties.

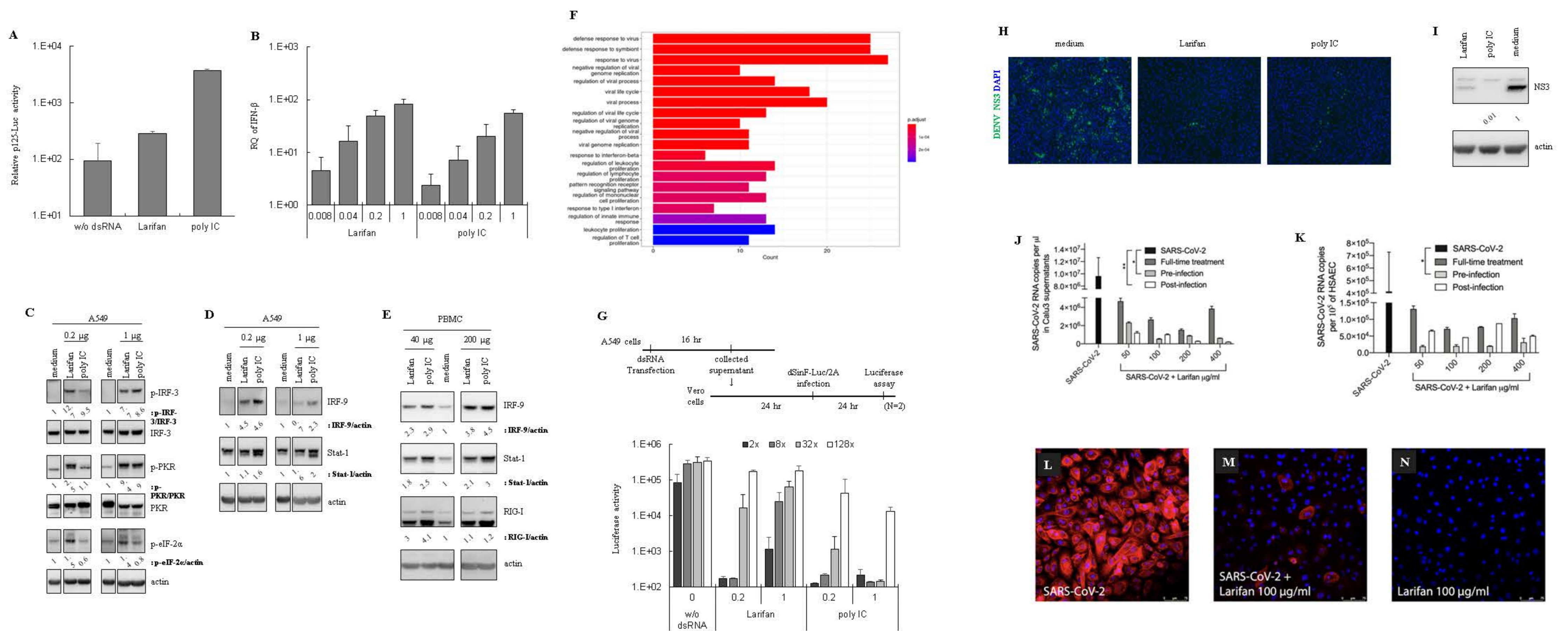
## Research Objective

The aim of this study was to test whether bacteriophage-derived double-stranded RNA or Larifan, similar to poly I:C, activates IFN system and exerts antiviral properties.

## Methods

Adenocarcinoma cell line A549 and luciferase reporter was used to test activation of IFN- $\beta$  promoter and antiviral effect of dsRNA against Sindbis virus. INF- $\beta$  expression was determined by RT-qPCR and activation of IFN signaling pathway by western blot analysis. The antiviral effect of dsRNA's was tested using dengue virus (DENV) and SARS-CoV-2 in A549 and human small airway epithelial cells (HSAEC), respectively. In addition, global transcriptional profiling in human peripheral mononuclear cells (PBMCs) after their treatment with Larifan was performed.

## Results & Discussion



### Poly IC and Larifan induce IFN- $\beta$ gene expression (A-B)

(A) A549 cells were co-transfected with the indicated dsRNAs, p125-Luc and pRL-TK for 16h. The cell lysates were harvested and analyzed by dual-luciferase assay. Firefly luciferase activity was normalized to that of Renilla luciferase, indicating both dsRNA's ability to activate IFN- $\beta$  promoter.

(B) A549 cells were transfected with the indicated dsRNAs for 16h and harvested for RT-qPCR of IFN- $\beta$  and actin. Relative quantification (RQ) of IFN- $\beta$  normalized to actin is shown.

### Poly IC and Larifan activate type I IFN signaling (C-E)

(C) A549 cells were transfected with dsRNAs for 6h and the cell lysates were collected for western blot analysis with the indicated antibodies.

(D) A549 cells were transfected with dsRNAs for 16h and IFN stimulated genes expression was determined with the indicated antibodies.

(E) Human peripheral blood mononuclear cells (PBMCs) were treated with the indicated dsRNA for 16 and the cell lysates were checked in western blot analysis against indicated antibodies.

### Transcriptome data analysis 24 h after PBMC treatment with Larifan (F)

The Gene Ontology Biological Process enrichment analysis.

### Poly IC and Larifan induce antiviral effects against Sindbis virus (G)

Experimental outline of the antiviral test where the conditioned medium was collected from transfected A549 cells and analyzed for antiviral activity against IFN-sensitive dSinF-Luc/2A showing that human A549 cells transfected with indicated dsRNAs reduced Sindbis virus replication.

### Poly IC and Larifan induce antiviral effect against dengue virus (DENV) (H-I)

A549 cells were transfected with dsRNA for 16 hrs and then were infected with dengue virus serotype 2 for 24 hrs. Then, (H) the cells were fixed for immunofluorescent staining with anti-dengue NS3 antibody and cell nuclei were stained by DAPI. (I) The cell lysates were collected for western blot analysis with the indicated antibody. Both dsRNAs suppressed DENV replication.

### Larifan in Calu3 and HSAEC cell lines inhibited the replication of SARS-CoV-2 (J-N)\*

(J) The drop of viral RNA copy numbers in the supernatant of Calu3 cells after treatment with Larifan.

(K) The drop of viral RNA copy numbers in HSAEC after treatment with Larifan.

(L-N) SARS-CoV-2 nucleoprotein (red) detection by immunocytochemistry in HSAEC upon treatment with 100  $\mu$ g/ml Larifan. Nuclei were stained with DAPI.

\*reproduced from Vaivode et al. *Pharmaceuticals (Basel)*. 2022 Aug 25;15(9):1053. doi: 10.3390/ph15091053.

## Conclusions

Tested dsRNA's are potent IFN stimulators and are able to turn on the antiviral response in virus infected cells.

This work was supported by the **European Regional Development Fund** project No. 1.1.1.1/18/A/099 and **"Strengthening of the capacity of doctoral studies at the University of Latvia within the framework of the new doctoral model"** project No. 8.2.2.0/20/I/006

## Contact Information

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INVESTING IN YOUR FUTURE

# Graudzētu un neapstrādātu cūku pupu un lēcu miltu funkcionālo īpašību novērtējums

Kristīne Ozoliņa, Inga Šarenkova, Sandra Muižniece - Brasava  
Latvijas Biozinātņu un tehnoloģiju universitāte



## Ievads

« Augu proteīnu izmantošana ir ekonomiska un daudzpusīga alternatīva ilgtspējīgas un videi draudzīgas pārtikas ar augstu uzturvērtību meklējumiem. Dažāda veida termiskā apstrāde būtiski uzlabo pākšaugu sagremojamību cilvēka organismā un palielina to funkcionalitāti, būtiski samazinot pākšaugu anti-uzturvērtību. Kā viena no pākšaugu apstrādes iespējām ir graudzēšana, kas ne tikai palīdz samazināt anti-uzturvērtību produktā, bet arī uzlabot funkcionālās īpašības.



## Pētījuma mērķis

« Pētījuma mērķis ir salīdzināt funkcionālās īpašības neapstrādātiem un graudzētiem cūku pupu un lēcu miltiem, lai izprastu graudzēšanas efektivitāti. Tika noteiktas dažādas pākšaugu miltu īpašības, kā ūdens uzsūkšanas spēja, mitrums, eļļas uzsūkšanas spēja, uzbriestspēja, krāsas analīze, putošanās spēja, putu stabilitāte, emulsijas aktivitāte, emulsijas stabilitāte, želēšanas temperatūra, pie kuras sākas želēšana un mazākā želēšanai nepieciešamā koncentrācija.



## Rezultāti un diskusija

### Miltu funkcionālās īpašības

	L1	L2	GL1	GL2	P1	P2	GP1	GP2
Mitrums, %	7.47 ± 0.45	7.79 ± 0.32	5.98 ± 0.12	7.12 ± 0.60	8.53 ± 0.41	8.74 ± 0.11	4.31 ± 0.32	4.41 ± 0.33
Uzbriestspēja, ml	10.50 ± 0.50	19.00 ± 1.50	17.50 ± 2.00	28.00 ± 2.00	10.50 ± 1.00	10.00 ± 0.50	14.50 ± 3.50	17.00 ± 2.00
Eļļas absorbcija, %	142.92 ± 2.45	135.32 ± 1.20	164.24 ± 3.65	161.89 ± 1.23	159.54 ± 2.10	146.77 ± 0.89	182.24 ± 2.21	187.33 ± 1.05
Ūdens absorbcija, %	186.10 ± 2.35	270.58 ± 0.55	357.43 ± 4.45	336.58 ± 1.21	152.07 ± 1.05	229.32 ± 3.09	322.90 ± 4.24	306.13 ± 2.87
Emulsijas aktivitāte, %	50.00 ± 1.00	40.90 ± 1.50	40.90 ± 2.00	40.90 ± 1.00	40.90 ± 2.00	45.45 ± 2.00	45.45 ± 1.50	45.45 ± 2.00
Emulsijas stabilitāte, %	18.18 ± 0.80	22.22 ± 0.50	95.00 ± 0.50	96.50 ± 0.33	22.22 ± 1.45	15.05 ± 0.50	90.50 ± 1.50	95.00 ± 1.00
Putu kapacitāte, %	44.50 ± 0.55	49.85 ± 0.90	7.50 ± 0.45	17.50 ± 0.50	30.00 ± 1.50	44.75 ± 0.45	10.35 ± 0.20	17.25 ± 0.55
Putu stabilitāte, %	86.36 ± 0.75	93.87 ± 0.89	57.12 ± 1.28	57.14 ± 1.56	66.67 ± 0.85	70.45 ± 0.79	40.00 ± 2.33	65.71 ± 0.95
Želēšanas temperatūra, °C	-	36.45 ± 0.67	-	45.22 ± 0.15	-	38.98 ± 1.45	-	48.35 ± 0.89
Želēšanas koncentrācija, %	-	12	-	8	-	16	-	12

L1 – Lēcu milti ar malumu 0.71 līdz 1.00 mm; L2 – Lēcu milti ar malumu <0.71 mm; GL1 – Graudzēti lēcu milti ar malumu 0.71 līdz 1.00 mm, GL2 – Graudzētu lēcu milti ar malumu <0.71 mm; P1 – Cūkupupu milti ar malumu 0.71 līdz 1.00 mm; P2 – Cūkupupu milti ar malumu <0.71 mm; GP1 – Graudzēti cūku pupu milti ar malumu 0.71 līdz 1.00 mm; GP2 – Graudzēti cūku pupu milti ar malumu <0.71 mm.

« Pētījuma rezultāti parādīja, ka graudzēti pākšaugu milti ir ievērojami vērtīgāki funkcionālo īpašību uzlabošanai nekā neapstrādāti pākšaugu milti. Graudzētos miltos ir mazāks mitruma saturs, tām ir mazāka putošanās spēja, putu noturība, kā arī graudzētiem miltiem ir nepieciešama mazāka koncentrācija, lai tā želētu ūdens vidē. Salīdzinot ar neapstrādātajiem miltiem, graudzētie milti uzrādīja, ka tiem ir ievērojami lielāka ūdens un eļļas absorbcijas spēja, uzbriestspēja un emulsijas stabilitāte, kā arī graudzētie milti spēj saželēt pie augstākas temperatūras nekā neapstrādātie milti. Miltiem tika veikta arī krāsu analīze un tā uzrādīja, ka graudzētajiem miltiem ir tumšāks tonis.



## Secinājumi

« Pēc pētījuma rezultātiem var secināt, ka pākšaugu graudzēšana var būt potenciāls veids, kā uzlabot to izmantošanu pārtikas veidošanā, samazinot pārstrādei un pagatavošanai nepieciešamo laiku un uzlabojot pārtikas gala produktu uzturvērtību.

Salīdzinājumā ar neapstrādātiem cūku pupu un lēcu miltiem, graudzētiem ir uzlabotas funkcionālas īpašības, kas uzlabo un atvieglo daudzus procesus pārtikas ražošanā.

« Šis pētījums tika finansēts no TEPEK projektu ZPAC projekta programmas "Izstrādāt tirgū konkurētspējīgus graudzētu pākšaugu krēmus, piemērojot tiem atbilstošu iepakojumu, kas spētu nodrošināt ilgāku uzglabāšanas termiņu, nepiemērojot īpašus uzglabāšanas apstākļus, vienlaikus saglabājot tā sensorās un fizikālās īpašības." projekts Nr. TEPV170.



## Kontaktinformācija

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Pupuchi



## Lauku pašnodarbināto personu sociālā apdrošināšana Baltijas valstīs

Jeļena Maksimenko, Inguna Leibus

Latvijas Biozinātņu un tehnoloģiju universitāte

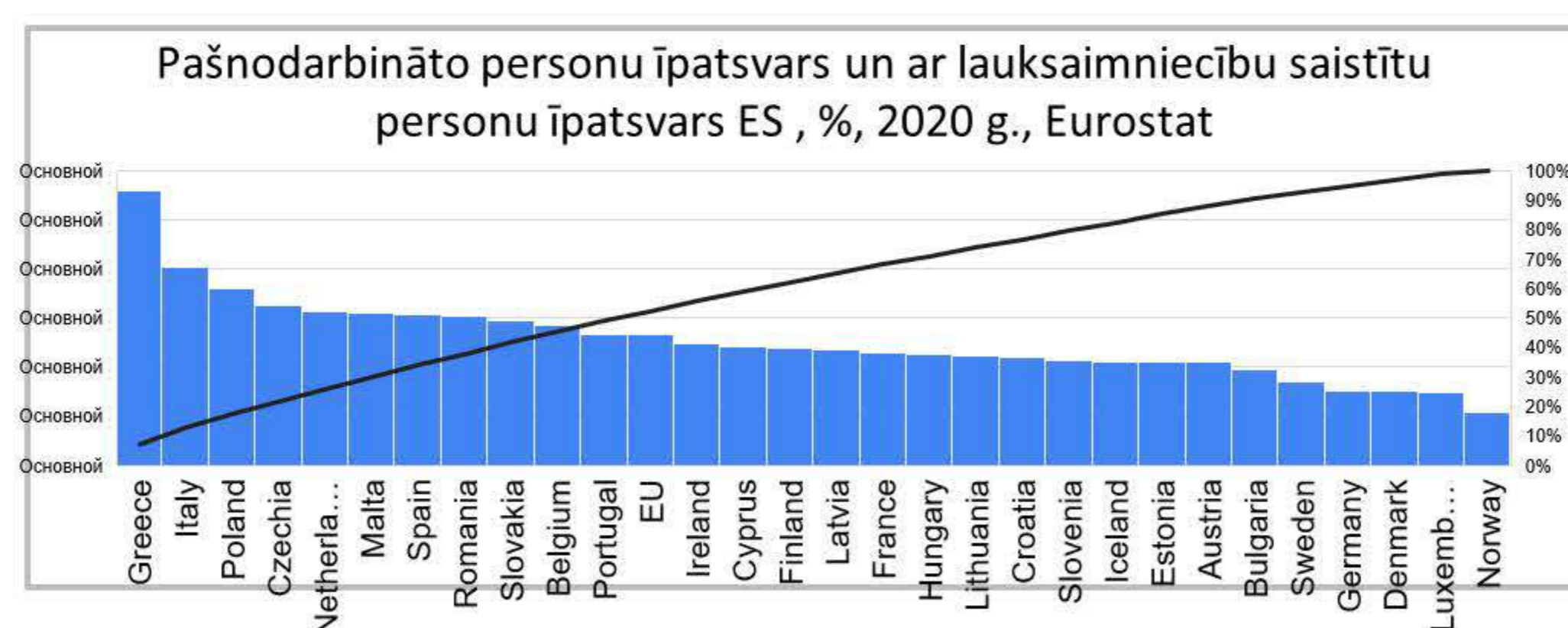
### Ievads

Latvijā, tāpat kā pārējās Baltijas valstīs, valsts sociālās apdrošināšanas obligāto iemaksu (VSAOI) likme par darbinieka apdrošināšanu tiek sadalīta starp darba devēju un darba ņēmēju, atšķirīga ir tikai sadalījuma proporcija. Savukārt pašnodarbinātās personas veic iemaksas par sevi pilnā apjomā, tomēr apdrošināšanas veidi un iemaksu aprēķināšanas kārtība visās trijās valstīs ir atšķirīga. Līdz ar to atšķiras arī pašnodarbināto sociālās drošības līmenis. Autori definē divas problēmas Latvijā, kas attiecas uz pašnodarbināto personu sociālo apdrošināšanu:

- 1) liels sociālo iemaksu slogs attiecībā pret ienākumiem;
- 2) nepietiekams sociālais nodrošinājums, kas mazina pašnodarbināto vēlmi veikt sociālās apdrošināšanas obligātās iemaksas.

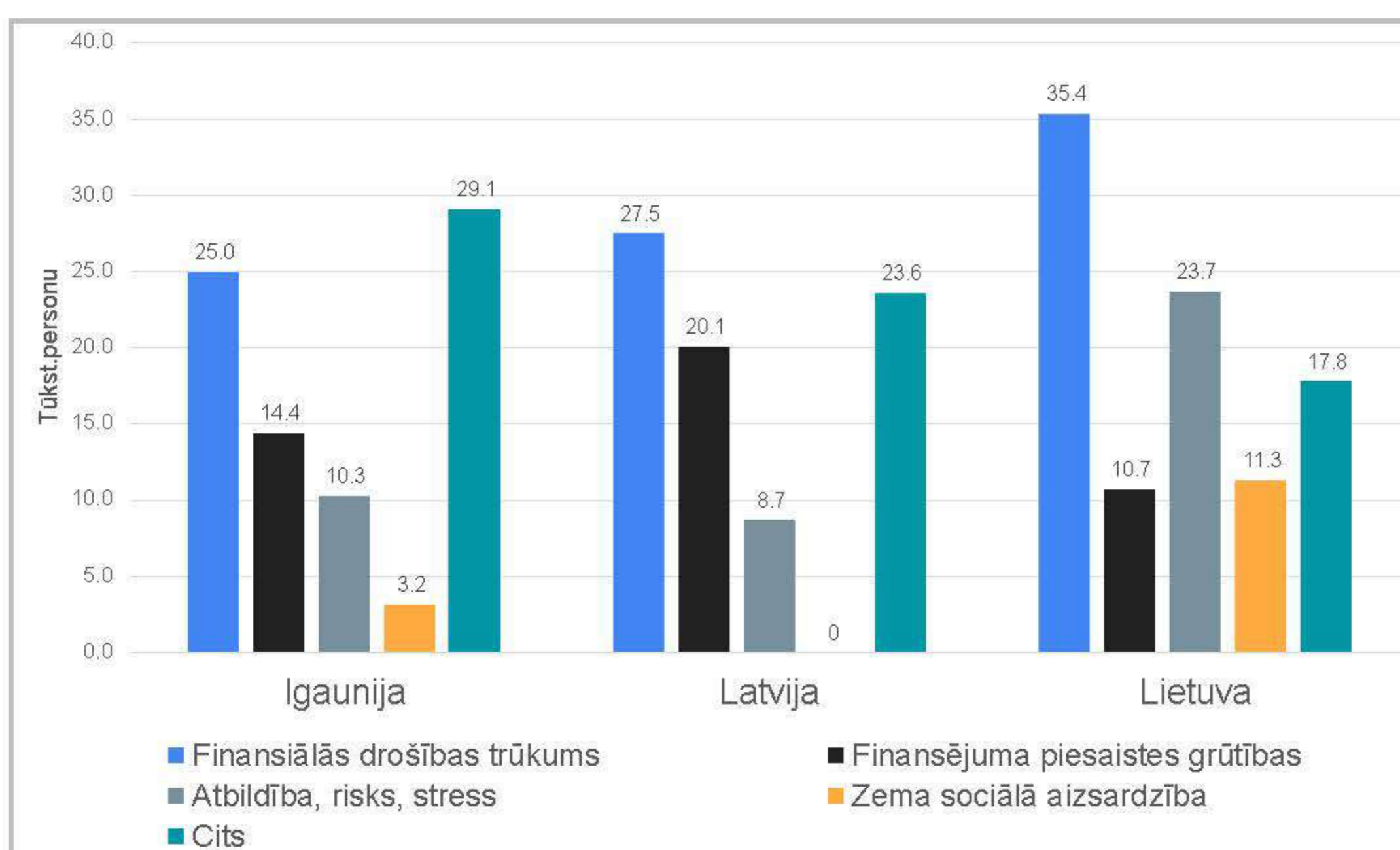
### Pētījuma mērķis

Izpētīt Latvijas, Lietuvas un Igaunijas valsts sociālo apdrošināšanu pašnodarbinātajiem un izvērtēt katrā valstī galvenās problēmas un ieguvumus. Pētījuma gaitā tika izpētīta statistika par pašnodarbinātām personām katrā Baltijas valstī, veikta pašnodarbināto sociālās apdrošināšanas sistēmas salīdzinošā analīze, definēta kaimiņvalstu pozitīvā pieredze, lai izvērtētu, ko Latvija varētu pārņemt sociālās apdrošināšanas jomā pašnodarbinātajiem



### Rezultāti un diskusija

Sociālās apdrošināšanas un iemaksu salīdzinājums Baltijas valstīs			
Rādītājs	Sociālās apdrošināšanas iemaksas		
	Latvija	Igaunija	Lietuva
Apdrošināšanas veids	Pensija, veselība, maternitāte, slimība, invaliditāte, bērnu kopšana	Pensija, veselība, maternitāte, slimība, invaliditāte, bērnu kopšana	Pensija, veselība, maternitāte, slimība
Sociālās apdrošināšanas iemaksu likme	32.15%	33%	19,5%
Papildus pensiju apdrošināšana	10%	2%	2.1-3%
Sociālo iemaksu minimālais objekts	EUR 620	EUR 725	EUR 607



Analizējot pašnodarbināto statistiku Baltijas valstīs, jāsecina, ka zemākais īpatsvars pret nodarbinātību 2020 gadā bija Igaunijā (10,54%), bet augstākais Latvijā (11,74%). Augstākais pašnodarbināto īpatsvars lauksaimniecībā Baltijas valstu vidū novērojams Lietuvā – 60%. Pašnodarbinātie Baltijas valstīs var izvēlēties maksāt nodokļus vispārējā kārtībā, kas ietver valsts sociālās apdrošināšanas iemaksas un iedzīvotāju ienākuma nodokli, vai arī izvēlēties kādu no atvieglotajiem nodokļu režīmiem. Latvijā privātpersonām ir iespēja izvēlēties maksāt patentmaksu, mikrouzņēmumu nodokli vai īpašu kārtību autoriem par autoratlīdzību. Lietuvā ir iespēja izvēlēties patentmaksu, savukārt Igaunijā – vienkāršoto nodokli, kas ietver gan sociālās iemaksas, gan ienākuma nodokli.

### Secinājumi

Latvijā pašnodarbinātās personas var izvēlēties maksāt mikrouzņēmumu nodokli, kas paredz vāju sociālo aizsardzību, jo nodokļa likme 25% apmērā no apgrozījuma ietver gan iedzīvotāju ienākuma nodokli, gan sociālās iemaksas. Gan Latvijā, gan Igaunijā pašnodarbinātajām personām ir iespēja maksāt samazinātu nodokli, kas ietver ienākuma nodokli un sociālās iemaksas.

Atšķirībā no Latvijas, Igaunijā vienkāršotais uzņēmējdarbības ienākuma nodoklis neparedz samazinātas nodokļa likmes. Tas vienkāršo nodokļu maksāšanas kārtību, aizstāj vairākus maksājumus un vienkāršo nodokļu aprēķinus. Rezultātā pašnodarbinātās personas, kas maksā vienkāršoto uzņēmējdarbības ienākuma nodokli, saņem tādu pašu sociālā nodrošinājuma līmeni kā pašnodarbinātie, kuri maksā ienākuma nodokli un veic sociālās iemaksas atsevišķi.

### Kontaktinformācija

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