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**Esports Physical Exercise/Performance Matrix 1.0 Country Factsheets:
A Protocol for National, Regional and Global Annual Assessment**

- A NEW STUDY PROTOCOL -

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has 10+ years' experience with particular focus on planning, conducting, and evaluating research studies dealing with health and exercise, which also include clinical trials. As a sports ainsight nd exercise scientist he uses knowledge of how the body works to help people improve their health and sporting ability at large. However, he has also profound into physical anthropology, and he understands the complexity of how physical activity affect the human body and its composition; but, also into social anthropology that helps to understand the social side of the same issues. With a background as a Ph.D. from the University of Novi Sad and postdoc from the University of Ljubljana, as well as a teacher and research at the University of Montenegro, he has achieved the following key competencies: knowledge of teaching and the ability to design courses, project and data management, study design expertise, excellent communication skills, and dissemination skills in both written and oral etc. He currently holds several leading positions in the national and international projects, as well as leading roles and memberships in the governing bodies of professional and scientific organizations.

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This protocol was developed to allow evaluators to collect up-to-date data and produce a comprehensive annual assessment through several specific indicators and ensure the outcomes that include the most relevant evidence about physical activity/exercise for esports players from each country and recognition of particular barriers for physical activity/exercise.

This protocol aims to create a methodology that will provide a better basis for establishing a standardized monitoring system on physical exercise and performance in esports players at national and regional levels as well as globally.

This protocol proposed 20 sociodemographic indicators that are available online and it will be compiled to identify the characteristics of the participating countries and describe country's demographic profile. On the other hand, this protocol proposed nine content indicators that were singled out for the assessment of physical exercise and performance in esports players. To evaluate each of the content indicators, a separate analysis has to be conducted, and a ten-point grading scale will be employed.

This protocol will initiate the national evaluators (researchers) to meet annually to produce national reports (the Country Factsheets) that will ensure effective and dynamic linkages between research and practice.

It is well-known that esports is defined as **"an organized and competitive approach to playing computer games"** (cited in Trotter et al., 2020); however, it is essential to draw attention to the fact that **"all esports are video games, but not all video games are esports."** From this point, esports has a competitive nature, and it is designed to have competition in its mind, while other video games are designed to entertain. As a result, esports is gradually gaining recognition as a sports competition (Gong et al., 2022).

Esports nature mentioned above caused excellent popularity, and, therefore, the esports industry experienced unprecedented growth worldwide, transforming competitive gaming into **a widely recognized sport**. Although esports events vary, from small tournaments to competitions held between close friends, their popularity indicates the market's potential and the global audience's growing appetite for international games with million-dollar prize money at stake. Namely, in 2022, the esports sector had achieved more than USD 1.45 billion and is **projected to grow from USD 1.72 billion in 2023 to USD 6.75 billion by 2030**, at a rate of over 21.15% per year during the forecast period (Fortune Business Insights, 2023).

Esports **has become a new phenomenon in scientific research** (Popovic et al., 2022) but also a magnet for new talents, the best place for investments, and a crucial participant at the intersection of contemporary technology, media, and culture. This is precisely why **an increasing number of social concerns occur in and around esports**, such as gender equity, diversity, cheating and doping, physical and mental health, and issues related to many other challenges; however, the researchers are most concerned about **the passive nature of esports and its long periods of sitting** in front of a computer or console (Yin et al., 2020).

It is well-known that a predominantly **sedentary lifestyle can hurt humans' but also esports players' health** (McNulty, 2023). **The daily physical inactivity reported by esports players varies from 5.5 to very high 11 hours a day** (Bayrakdar et al., 2020; DiFrancisco-Donoghue et al., 2019; Rudolf et al., 2019). Therefore, the adverse effects of physical inactivity on the specific cognitive skills of esports players, which are highly correlated to success in esports games, might be, and should be reduced in the future. Although researchers have shown significant interest in improving the health of esports players, it is still too early to say that there are solid conclusions and helpful health promotion strategies for esports players. However, it is a fact that **the scientific community is increasingly talking about the necessity of implementing organized physical exercise in everyday trainings of esports players** due to the broad physiological benefits and evident cognitive improvements.

Several national, regional, and global monitoring systems track physical activity for the general population and compare surveillance systems developed by various researchers to track physical activity behavior and aid in physical activity assessment. **There is currently no system supporting physical activity/exercise for enhancing esports player performance and health**, even though many researchers conducted independent studies with the same purposes. For a reason, tracking specific indicators over time is a crucial surveillance tactic that will allow for assessing changes in esports players' behavior; this protocol aims to create **a methodology that will provide a better basis for establishing a standardized monitoring system on physical exercise and performance in esports players** at national level primarily, but also at regional and globally.

This protocol was developed based on the authors' previous good practices from similar cases. It will **allow many country representatives to collect up-to-date data and produce a comprehensive annual assessment** through several specific indicators to ensure that the outcomes include the most relevant evidence about physical activity/exercise for esports players from each country and particular barriers for physical activity/exercise. **Once the evaluation is completed in each country, the responses will be summarized for reporting and research**.

The COUNTRY FACTSHEETS, a resource that aggregates statistics related to physical activity/exercise levels among esports players, will be developed and disseminated to gain a comprehensive understanding of the global variation in esports players' physical activity/exercise related indicators and critical influences.

The COUNTRY FACTSHEETS serve as an advocacy tool, holding decision-makers accountable and urging them to take action on how stakeholders may implement new initiatives, programs, and policies to promote healthy surroundings and increase esports players' physical activity and health.

A group of content experts from the regional project under the title **"Report and Content Analysis on Physical Exercise and Performance of Esports Players"** (approved by the Western Balkan Fond: No. MO-2-006) and its external collaborators has been **formed to create a new study protocol for collecting up-to-date data and producing a comprehensive annual assessment** how esports industry is doing as a whole at promoting and facilitating physical activity/exercise opportunities for esports players, through the list of specific indicators (to which grades will be assigned).
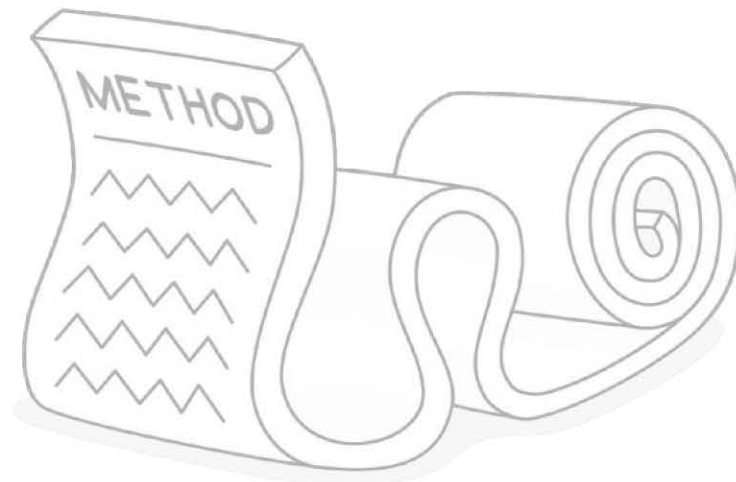
This study protocol will initiate the national evaluators (researchers) to meet annually to review the most relevant evidence about physical activity/exercise for esports players from each country and produce national reports (the Country Factsheets) to **ensure effective and dynamic linkages between research and practice**. Therefore, the Country Factsheets will play a key role in informing discussions that will lead to action on the physical inactivity of esports players and tangible improvements in the health of esports players and their performance in the future. This study protocol was developed based on the authors' previous experience with the leading methodologies for the physical activity assessment of the general population (Aubert et al., 2018; Colley et al., 2012; Varela et al., 2022), and it will **assist individuals and groups working to promote physical activity/exercise for esports players**.

The Country Factsheets will be the primary output of this study protocol that will be developed through a harmonized and transparent process by **collecting and collating the best available evidence and always produced in both short and expanded versions** in English and disseminated through media and public awareness activities, undertaking **knowledge exchanges through scientific conferences and workshops**, and developing key partnerships with all interested stakeholders.

This study protocol proposed **20 sociodemographic indicators** (country, total population; urban population; human capital index; GDP per capita; GDP growth; unemployment; literacy rate; government expenditure on education; government expenditure on recreational and sporting services; individuals using the internet; mobile cellular subscriptions; fixed broadband subscriptions; high-technology exports; public health expenditure; life expectancy at birth; physical activity prevalence; deaths due to physical inactivity; national physical activity plan; esports national federation; and Olympic esports medals) that are available online and it will be compiled to identify the characteristics of the participating countries and **describe country's demographic profile** (supporting information files 1).

This protocol proposed **nine content indicators** that were singled out for the assessment of physical exercise and performance in esports players (overall physical activity/exercise; formal physical activity/exercise; informal physical activity/exercise; active transportation; sedentary behaviours; physical performance; esports organization; community and environment; and government) as described in the previously mentioned supporting information file 2. The authors of this study protocol will **regularly collect inputs from their stakeholders to improve and refine the list of indicators** each year, as well as request external evaluation that will consider its inputs, outputs, and immediate, intermediate, and long-term outcomes.

To evaluate each of the content indicators, a separate analysis has to be conducted, and **a ten-point grading scale** will be employed (10 = exceptional; 9 = excellent; 8 = very good; 7 = good; 6 = fairly good; 5 = satisfactory; 4 = quite satisfactory; 3 = poor; 2 = very poor; 1 = failing; 0 = without reliable information). The grades will be awarded based on **data found in available scientific articles in the last 10 years as well as in the secondary data sources such as governmental and nongovernmental reports and online content from a specific period**. Then, the findings will be synthesized, and the grade assessment process will be completed by using the grading framework described in the supporting information file 3. Each indicator will be discussed until a grade consensus is reached among the evaluators.

The reliability of content analysis will encompass the operationalization of the concept of physical exercise and performance in esports players in this study protocol, the training coders for implementation of the formulated concept of physical exercise and performance in esports players, and the evaluation of the implementation over the reliability of coders (Riff et al., 2012). The inter-judge agreement index will be calculated using **Cohen's kappa coefficient (к)**, as suggested by McHugh (2012), to address potential bias issues. **The electronic databases (SportDiscus, Scopus, PubMed/MEDLINE, and Web of Science)** will be used to search research articles, **Open Access Theses and Dissertations (OATD) and Networked Digital Library of Theses and Dissertations (NDLTD)** to search theses and dissertations, and **Google** to search other documents and online content needed to evaluate the content indicators. Full search syntax that will be used for each database are described in the supporting information file 4.

This protocol was developed to allow evaluators to collect up-to-date data and produce a comprehensive annual assessment through several specific indicators and ensure the outcomes that include the most relevant evidence about physical activity/exercise for esports players from each country and recognition of particular barriers for physical activity/exercise. When interpreting the expected results, **all evaluators will compare their grades and determine the initial inter-judge agreement Cohen's kappa coefficient** (κ). After a review of all source data, the evaluators will find additional information that will contribute to maximizing the inter-judge agreement **(k = 1).**

$$\kappa = \frac{p_0 - p_e}{1 - p_e},$$

An accepted and significant **percent of intercoder reliability** will confirm that all coders will be well-introduced in the coding protocol and well-introduced to the codebook in their reports. The expected **results will be presented in grades (0-10)** for each content indicator, awarded based on different numbers and the quality of selected documents (scientific articles, governmental and nongovernmental reports, and online content). In each Country Factsheets, next to 20 sociodemographic indicators that describe the country's demographic profile, nine content indicators will be reviewed and indicate the assessment of physical exercise and performance in esports players. **A total average score of these nine content indicators will be calculated**, which, in a way, will represent a level of physical exercise and performance in esports players at large.

This section will also include information about the target audience and the outcomes of this study protocol. <u>The primary target audiences</u> for the Country Factsheets are esports organizations (**practitioners**), as well as governmental and nonprofit organizations (**policymakers and educators**) whose policy and programming influence physical activity/exercise for enhancing esports player performance and health. Furthermore, all types of media are also considered an additional target of the Country Factsheets, as strong media engagement is critical for raising awareness and educating the general public but also representatives of esports organizations to engage players more in physical activity/exercise.

Although not a primary audience of the Country Factsheets, **the general public will have strong recognition of the Country Factsheets** because of the substantial media attention it will receive; however, it is crucial to highlight that the primary purpose of this protocol outcomes will remain very clear and committed to its mandate to inform practitioners, educators, and policymakers, rather than the general public. **Dissemination and media coverage of the Country Factsheets will grow steadily through social media campaigns** and a specific response to the Country Factsheets releases each year that will focus on recommendations to increase physical activity/exercise for enhancing esports player performance and health outlined in the Country Factsheets.

Immediate outcomes will be increasing the awareness among decision-makers about the importance of the physical activity to the health of esports players and the contribution that the Country Factsheets makes to raising this awareness; increasing awareness in the media of the importance of physical activity for esports players, and the contribution that the Country Factsheets makes to raising this awareness; constant involvement of relevant organizations interested in advancing knowledge and advocating changes to policies and programs that increase physical activity opportunities for esports players; and growing recognition of the Country Factsheets as a reliable source of research data about physical activity levels of esports players, and as an advocate for esports players.

On the other hand, **intermediate outcomes** will be creating government and non-government stakeholders policies, programs, and campaigns that will increase physical activity opportunities for esports players by esports organizations. In contrast, **long-term outcomes** will be measured as the percentage of esports players that are physically active enough to benefit their health.

This study protocol was proposed in line with the authors' integrity, fidelity, and honesty. Still, the study protocol users will openly take responsibility for their actions and only make agreements they intend to keep. They will not intentionally engage in or participate in malicious harm to another person or animal.

S1 Table. Country's demographic profile.
(DOCX)

S2 Table. Esports PEP Matrix 1.0 Indicators and Benchmarks Used to Guide the Grade Assignment Process.
(DOCX)

S3 Table. Esports PEP Matrix 1.0 Grading System.
(DOCX)

S4 Table. Full search syntax used for each database.
(DOCX)

Questions
Country for which you are providing responses:
Total population (number of people):
Urban population (%):
Human capital index (number between 0 and 1):
GDP per capita (current US$):
GDP growth (annual %):
Unemployment, total (% of total labor force):
Literacy rate, adult total (% of people ages 15 and above):
Government expenditure on education, total (% of government expenditure):
Government expenditure on recreational and sporting services, total (% of government expenditure):
Individuals using the Internet (% of population):
Mobile cellular subscriptions (per 100 people):
Fixed broadband subscriptions (per 100 people):
High-technology exports (current US$):
Public health expenditure (% of GDP):
Life expectancy at birth, total (years):
Physical activity prevalence (%):
Deaths due to physical inactivity (%):
National physical activity plan (Y/N):
Esports national federation (Y/N):

Indicator	Benchmark
Overall Physical Activity/Exercise	% of esports players who meet the Canadian Sedentary Behaviour Guidelines (Ross et al., 2020), which recommend that aged group 18-64 years old accumulate at least 150 minutes of moderate to vigorous aerobic physical activity throughout the week; muscle strengthening activities using major muscle groups at least twice a week; and several hours of light physical activity, including standing.
Formal Physical Activity/Exercise	% of esports players who participate in organized (formal) physical activity/exercise programs within esports organization.
Informal Physical Activity/Exercise	% of esports players who participate in unorganized (informal) physical activity/exercise at any intensity for more than 2 hours a day. % of esports players who report being outdoors for more than 2 hours a day, without sitting or lying with low energy expenditure.
Active Transportation	% of esports players who use active transportation, such as wheeling, walking and cycling, to get to and from places they visit on the daily bases.
Sedentary Behaviours	% of esports players who meet the Canadian Sedentary Behaviour Guidelines (Ross et al., 2020), which recommend that aged group 18-64 years old spent at most 8 hours a day sitting or lying with low energy expenditure, while awake, in the context of occupational, educational, home and community settings, and transportation.
Physical Performance	Average percentile values achieved on certain physical fitness indicators based on the normative published by Hoffmann et al. (2019).
Esports Organization	% of esports organization with active institutional policies such as daily physical activity/exercise programs. % of esports organizations where the majority of esports players are taught by a certified physical activity/exercise specialists. % of esports organizations where the majority of esports players have regular access to facilities and equipment that support physical activity/exercise.
Community and Environment	% of esports players who report having physical activity/exercise facilities or programs available to them in their community and environment (e.g. home, neighbourhood, school, work, et cetera).
Government	% of esports organization that report receiving any funds and resources for the implementation of physical activity/exercise programs for esports players. % of esports organization that report any evidence of leadership in providing any specific type of physical activity/exercise opportunities for esports players. % of esports organization that report any demonstrated progress through the key stages of public policy making.

Grade	CI	Description
10	90% ≤	Exceptional
9	80%–89%	Excellent
8	70%–79%	Very Good
7	60%–69%	Good
6	50%–59%	Fairly Good
5	40%–49%	Satisfactory
4	30%–39%	Quite Satisfactory
3	20%–29%	Poor
2	10%–19%	Very Poor
1	≤10%	Failing
0	Insufficient or inadequate information to assign a grade	Incomplete

Note. CI – Class Intervals represent the difference between the upper class limit and the lower class limits of available information.

Database	Search Syntax
Scopus	title-abs-key("physical activity" or "physical excercise" or sedentar* or sitting) and title-abs-key(esport) and title-abs-key([country])
PubMed/MEDLINE	("physical activity"[tw] OR "physical exercise"[tw] OR sedentar*[tw] OR sitting[tw]) AND (esport[tw] AND [country][tw])
Web of Science, SportDiscus (through EBSCOhost) Open Access Theses and Dissertations (OATD), Networked Digital Library of Theses and Dissertations (NDLTD)	("physical activity" or "physical exercise" or sedentar* or sitting) and (esport) and ([country])
Google	"physical activity" or "physical exercise" or sedentar* or sitting and esport* and [country]

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Thank you!