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**A Systematic Review of Job
Demands and Resources Associated
with Compassion Fatigue in Mental
Health Professionals**

Volume 17 · Issue 19 | October (I) 2020



mdpi.com/journal/ijerph
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Interests: social risk & protective factors for suicide; culture of suicide; suicide acceptability; media and suicide; religion and suicide; economic strain and suicide; marital strain and suicide; temporal patterns and suicide; cross-national analysis of suicide



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Website (<https://www.researchgate.net/profile/Evangelos-Alexopoulos-2>) **SciProfiles** (<https://sciprofiles.com/profile/9295>)

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Interests: interval training; VO2max; metabolism; spinal cord injury



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Interests: prevention; violence; resilience; relationship and sexual violence prevention; program evaluation



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Interests: occupational and environmental health; cardiovascular autonomic nervous system and work ability; shift work; sleep disorders; syncope and orthostatic intolerance syndromes; heart rate, blood pressure and respiratory activity variability

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Website (<https://www.shu.ac.uk/about-us/our-people/staff-profiles/margo-barker>)

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Interests: food choice; diet; nutrition; epidemiology; public health



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Website (<https://www.uke.de/english/departments-institutes/institutes/medical-biometry-and-epidemiology/team/index.html>)

SciProfiles (<https://sciprofiles.com/profile/433025>)

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Interests: social epidemiology; migrant research; stroke; cancer; statistical methods in epidemiology

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Website (<https://www.sydney.edu.au/medicine-health/about/our-people/academic-staff/katy-bell.html#collapseprofilekeywords>)

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Interests: evidence-based health policy; decarbonisation of health care; clinical epidemiology; health services research; health technology assessment; screening and diagnostic test evaluation; medical overuse; overdiagnosis



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Website (<https://www.unifg.it/ugov/person/3397>) **SciProfiles** (<https://sciprofiles.com/profile/602870>)

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Interests: redox biology; mitochondria; senescence; translational research; stem cells



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Website (<https://www.einstein.yu.edu/faculty/4758/karen-bonuck/>)

Section Board Member

Department of Family Medicine, Albert Einstein College of Medicine, 1300 Morris Park Ave, Bronx, NY 10461, USA

Interests: pediatric sleep health; pediatric sleep problems; early childhood feeding; early childhood sleep; developmental disabilities



Dr. Alberto Borraccino

Website (https://dssppen.campusnet.unito.it/do/docenti.pl/Show?_id=aborracc#tab)

SciProfiles (<https://sciprofiles.com/profile/1142140>)

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Department of Public Health and Paediatrics, University of Torino, 10126 Torino, Italy

Interests: public health; programme planning and evaluation; health promotion; health education; adolescents health; quantitative methods; qualitative approaches in research

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Website (<https://www.maastrichtuniversity.nl/hans.bosma/research>) **SciProfiles** (<https://sciprofiles.com/profile/673566>)

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Department of Social Medicine, CAPHRI Research School, Maastricht University, P.O. Box 616, 6200 MD Maastricht, The Netherlands

Interests: socioeconomic determinants of health; psychosocial factors and health; quantitative research methods; life-course



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Website (<http://www.tars.unsw.edu.au/staffdirectory/boufous.html>) **SciProfiles** (<https://sciprofiles.com/profile/157398>)

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Interests: road safety; data linkage; injury prevention; transport crashes in the media; burden of road trauma



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Website (<https://www.linkedin.com/in/stergios-boussios-89238883/>) **SciProfiles** (<https://sciprofiles.com/profile/554800>)

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Interests: ovarian cancer; cervical cancer; carcinoma of unknown primary; prostate cancer, renal cancer, colorectal cancer; cancer in pregnancy; metastatic spinal cord compression; cancer and autoimmune diseases

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Website (http://depts.washington.edu/hserv/faculty/Bowen_Deborah) **SciProfiles** (<https://sciprofiles.com/profile/502859>)

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Department of Bioethics and Humanities, University of Washington, Seattle, WA 98195, USA

Interests: cancer prevention; community intervention; health behavior change

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(<https://www.docenti.unina.it/#!/professor/4341524d454c4142524156414343494f425256434d4c36384835304638333957/curriculum>)

SciProfiles (<https://sciprofiles.com/profile/1295166>)

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Department of Translational Medicine, Federico II University, 80131 Naples, Italy

Interests: autism; child psychiatric; Rett syndrome; depression; psychopharmacology in children

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Website (<https://profiles.ucsd.edu/arthur.brody>) **SciProfiles** (<https://sciprofiles.com/profile/2165378>)

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1. Department of Psychiatry, University of California San Diego, La Jolla, CA 92093, USA

2. Department of Psychiatry, Veterans Administration San Diego Healthcare System (VASDHS), San Diego, CA 92161, USA

Interests: tobacco use disorder; positron emission tomography; treatment of cigarette smoking; brain imaging; substance use disorders



Prof. Dr. Iain Broom

Website (<https://www3.rgu.ac.uk/dmstaff/broom-ian/>) **SciProfiles** (<https://sciprofiles.com/profile/183080>)

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Centre for Obesity Research and Epidemiology (CORE), School of Pharmacy and Life Sciences, Robert Gordon University, Earl of Mar Road, Aberdeen AB10 7QB, UK

Interests: diabetes; obesity; metabolism; nutrition; trauma; sepsis

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Dr. Carlos Brotons

Website (<http://www.eapsardenya.cat>) **SciProfiles** (<https://sciprofiles.com/profile/1523965>)

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Research Unit, Sardanya Primary Health Care Center, Biomedical Research Institute Sant Pau, 08025 Barcelona, Spain

Interests: cardiovascular disease prevention; primary health care; general practice; health promotion; cardiovascular diseases; dyslipidemias; risk factors



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Website (<https://www.pbrc.edu/research-and-faculty/faculty/?faculty=3622>) **SciProfiles** (<https://sciprofiles.com/profile/2164594>)

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Contextual Risk Factors Laboratory, Pennington Biomedical Research Center, 6400 Perkins Avenue, Baton Rouge, LA 70808, USA

Interests: physical activity; obesity; built environment; social environment; social determinants of health; health equity



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Website (https://faculty.utah.edu/u0708889-RYAN_DONALD_BURNS/hm/index.html)

SciProfiles (<https://sciprofiles.com/profile/470381>)

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Department of Health and Kinesiology, University of Utah, Salt Lake City, UT 84112, USA

Interests: academic performance; adolescents; children; cognitive development; health; longitudinal analysis; physical activity; sports

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Website (https://www.medschool.lsuhsu.edu/physiology/faculty_detail.aspx?name=byerley_lauri)

SciProfiles (<https://sciprofiles.com/profile/1747830>)

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Sports and Health Sciences, School of Health Sciences, American Public University System, Charles Town, WV 25414, USA

Interests: diet; gut microbiome; body composition; cancer cachexia; sports nutrition; assessment of dietary intake and the role of dietary constituents on health; nutrition education of health science students

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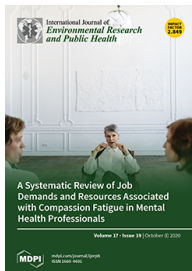
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Cover Story ([view full-size image \(/files/uploaded/covers/ijerph/big_cover-ijerph-v17-i19.png\)](#)): Mental healthcare is an emotionally taxing occupation that demands from professionals to emotionally relate with clients to understand their concerns. However, a continuous exposure to emotional demanding narratives can lead to compassion fatigue. The majority of the research on compassion fatigue addresses the role played by individual-level factors such as empathy, history of trauma, and attachment style, among others. The present systematic review focused on alterable work-related factors associated with compassion fatigue. The results suggested that exposure to workplace trauma, workload, and therapeutic settings were positively associated with compassion fatigue. Further, the provision of organizational resources and support and the availability of co-workers' and supervisor's support were negatively associated with compassion fatigue. [View this paper. \(https://www.mdpi.com/1660-4601/17/19/6987\)](https://www.mdpi.com/1660-4601/17/19/6987)

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Validation and Adaptation of the “Modified Transplant Symptom Occurrence and Symptom Distress Scale” for Kidney Transplant Recipients (/1660-4601/17/19/7348)

by [Jisu Kim \(https://sciprofiles.com/profile/810482\)](https://sciprofiles.com/profile/810482) and [Insil Jang \(https://sciprofiles.com/profile/1065302\)](https://sciprofiles.com/profile/1065302)

Int. J. Environ. Res. Public Health **2020**, *17*(19), 7348; <https://doi.org/10.3390/ijerph17197348> (<https://doi.org/10.3390/ijerph17197348>) - 08 Oct 2020

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Abstract The aim was to adapt and validate the Modified Transplant Symptom Occurrence and Symptom Distress Scale (MTSOSD-59R) for kidney transplant recipients undergoing immunosuppressive therapy in Korea. The MTSOSD-59R has been used with solid organ transplant recipients globally to

assess the adverse effects of [...] [Read more.](#)

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[The Role of the Teacher in the Implementation of a School-Based Intervention on the Physical Activity Practice of Children \(/1660-4601/17/19/7344\)](#)

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[Theo Caron \(https://sciprofiles.com/profile/author/RTFXMmlXc2swMHZnSjhkbVgvZGp0NDNGSEJ4ZW9IRFBSUVpUnRIRmt1bz0=\)](#),

[Marie-Belle Ayoub \(https://sciprofiles.com/profile/author/UjgwU2NPelBON1o3ZFihL1YvK0IBWktGZ3d3ODA4RW9LcVFIUVJwMVJoRG5tcEEwC\)](#)

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Int. J. Environ. Res. Public Health **2020**, *17*(19), 7344; <https://doi.org/10.3390/ijerph17197344> (<https://doi.org/10.3390/ijerph17197344>) - 08 Oct 2020

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Abstract Medium- or long-term intervention strategies for physical activity practice (PAP) need to be more effective in terms of their implementation by practitioners. The aim of this study was to evaluate the role of a teacher to implement the Team Pentathlon (TP) in order [...] [Read more.](#) (This article belongs to the Special Issue [Measurement and Evaluation in Physical Education, Physical Activity and Sports \(/journal/ijerph/special_issues/evaluation_sports\)](#))

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[Effect of Five Bench Inclinations on the Electromyographic Activity of the Pectoralis Major, Anterior Deltoid, and Triceps Brachii during the Bench Press Exercise \(/1660-4601/17/19/7339\)](#)

by

[David Rodríguez-Ridao \(https://sciprofiles.com/profile/author/bGlvRXh0bVJiMHNPGRN1SGg0L1dTVIixM0V2YjJiY1FyNDZvMjdwK3IKQT0=\)](#),

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[Isabel Martín-Fuentes \(https://sciprofiles.com/profile/2156965\)](#) and [José M. Muyor \(https://sciprofiles.com/profile/797003\)](#)

Int. J. Environ. Res. Public Health **2020**, *17*(19), 7339; <https://doi.org/10.3390/ijerph17197339> (<https://doi.org/10.3390/ijerph17197339>) - 08 Oct 2020

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Abstract The bench press exercise is one of the most used for training and for evaluating upper-body strength. The aim of the current study was to evaluate the electromyographic (EMG) activity levels of the pectoralis major (PM) in its three portions (upper portion, PMUP, [...] [Read more.](#) (This article belongs to the Special Issue [Monitoring and Evaluation of Training in Sport and Exercise \(/journal/ijerph/special_issues/monitoring_evaluation\)](#))

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[Health-Related Behaviors in Adolescents Mediate the Association between Subjective Social Status and Body Mass Index \(/1660-4601/17/19/7307\)](#)

by [Asborg A. Bjertnaes \(https://sciprofiles.com/profile/1230325\)](#), [Catherine Schwinger \(https://sciprofiles.com/profile/1213940\)](#),

[Petur B. Juliusson \(https://sciprofiles.com/profile/author/RFVnaW40U0NmWEs1MGtQV3BtU2JvNkU1Q1dvMVBCQ0xvRzRleG9pZ3F5RT0=\)](#),

[Tor A. Strand \(https://sciprofiles.com/profile/183239\)](#), [Mads N. Holten-Andersen \(https://sciprofiles.com/profile/1046739\)](#) and

[Kjersti S. Bakken \(https://sciprofiles.com/profile/957065\)](#)










Int. J. Environ. Res. Public Health **2020**, *17*(19), 7307; <https://doi.org/10.3390/ijerph17197307> (<https://doi.org/10.3390/ijerph17197307>) - 07 Oct 2020

Cited by 4 (/1660-4601/17/19/7307#metrics) | Viewed by 1768

Abstract The aim of this study was to explore the association between adolescent subjective social status (SSS) and body mass index (BMI) at two different time points and to determine whether this association was mediated by health-related behaviors. In 2002 (n = 1596) and [...] [Read more.](#) (This article belongs to the Special Issue [Global Burden of Disease: Diversity of Socioeconomic Consequences Worldwide \(/journal/ijerph/special_issues/disease_burden\)](#))

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Supporting Parents Living in Disadvantaged Areas of Edinburgh to Create a Smoke-Free Home Using Nicotine Replacement Therapy (NRT): A Two-Phase Qualitative Study ([/1660-4601/17/19/7305](#))by  Rachel O'Donnell (<https://sciprofiles.com/profile/727983>),  Grace Lewis (<https://sciprofiles.com/profile/1097732>),
 Colin Lumsdaine ([!\[\]\(068cc37fea7b7e82ca55b0672b7cbfba_img.jpg\) \[Giovanna Di Tano\]\(https://sciprofiles.com/profile/1285319\) \(<https://sciprofiles.com/profile/1285319>\),](https://sciprofiles.com/profile/author/SXYrNktrd2ZhTFdqZWI1V3FqL2NNTnFyREIVZXpYM0VoT1p3NG1zYkRqaHdSMkZJaHF)</div>
<div data-bbox=) [Liz Swanston](https://sciprofiles.com/profile/author/QkxqNDJLYnRYYUM4MDIxQW1MOEFTT2NkrjBPN2dDSWI6TFcvMnAwVIQ1LzkdHhXTkh) (<https://sciprofiles.com/profile/author/QkxqNDJLYnRYYUM4MDIxQW1MOEFTT2NkrjBPN2dDSWI6TFcvMnAwVIQ1LzkdHhXTkh>) [Gillian Amos](https://sciprofiles.com/profile/author/Ujk2bXVPRlcZVjkyVHPCU2FIRjdYblpQMTZ0aG5MMytNYkR3bEhEdkJvcFM3UHVXVGJJMF) (<https://sciprofiles.com/profile/author/Ujk2bXVPRlcZVjkyVHPCU2FIRjdYblpQMTZ0aG5MMytNYkR3bEhEdkJvcFM3UHVXVGJJMF>) [Anne Finnie](https://sciprofiles.com/profile/author/aUIQTmx0aFRuYII5UUIxbWF6cFZ2TFo1VjJjZFYQ3JyR1Y5cXN5c1ZWazNwdzd5bVREeFfS) (<https://sciprofiles.com/profile/author/aUIQTmx0aFRuYII5UUIxbWF6cFZ2TFo1VjJjZFYQ3JyR1Y5cXN5c1ZWazNwdzd5bVREeFfS>) and [Neneh Rowa-Dewar](https://sciprofiles.com/profile/183842) (<https://sciprofiles.com/profile/183842>)*Int. J. Environ. Res. Public Health* **2020**, *17*(19), 7305; <https://doi.org/10.3390/ijerph17197305> (<https://doi.org/10.3390/ijerph17197305>) - 07 Oct 2020
Viewed by 1871**Abstract** Exposure to second-hand smoke (SHS) in the home is largely associated with socio-economic disadvantage. Disadvantaged parents face specific challenges creating a smoke-free home, often caring for children in accommodation without access to outdoor garden space. Existing smoke-free home interventions largely fail to accommodate [...] [Read more](#).(This article belongs to the Section [Health Behavior, Chronic Disease and Health Promotion](#) (/journal/ijerph/sections/health_promotion))**Show Figures**https://pub.mdpi-res.com/ijerph/ijerph-17-07305/article_deploy/html/images/ijerph-17-07305-g001-550.jpg?1602291750) (https://pub.mdpi-res.com/ijerph/ijerph-17-07305/article_deploy/html/images/ijerph-17-07305-g002-550.jpg?1602291750) (https://pub.mdpi-res.com/ijerph/ijerph-17-07305/article_deploy/html/images/ijerph-17-07305-g003-550.jpg?1602291750)**Comorbid Anxiety and Depression among Pregnant Pakistani Women: Higher Rates, Different Vulnerability Characteristics, and the Role of Perceived Stress** ([/1660-4601/17/19/7295](#))by  [Shahirose Sadrudin Premji](https://sciprofiles.com/profile/811651) (<https://sciprofiles.com/profile/811651>), [Sharifa Lalani](https://sciprofiles.com/profile/author/Zlc5NnF0dkxtVWpDWGNM29QktIRXY1dTVUTGFzOTJVVwk0xeVVLbXhCcz0=) (<https://sciprofiles.com/profile/author/Zlc5NnF0dkxtVWpDWGNM29QktIRXY1dTVUTGFzOTJVVwk0xeVVLbXhCcz0=>), [Kiran Shaikh](https://sciprofiles.com/profile/author/cG5MQnNGUDh2cnhFbndaN0Jdc0JjZ2ZtbU8wVW94ZjNzUG9ZRVFEQWxPcz0=) (<https://sciprofiles.com/profile/author/cG5MQnNGUDh2cnhFbndaN0Jdc0JjZ2ZtbU8wVW94ZjNzUG9ZRVFEQWxPcz0=>), [Ayesha Mian](https://sciprofiles.com/profile/author/b1ZYL2xWRU9PZkFEeIRvb3E1Q1hSNDBpVXBzchpJmN4YUjBH3ZQc2F4OD0=) (<https://sciprofiles.com/profile/author/b1ZYL2xWRU9PZkFEeIRvb3E1Q1hSNDBpVXBzchpJmN4YUjBH3ZQc2F4OD0=>), [Ntonghanwah Forcheh](https://sciprofiles.com/profile/author/MmhqTWM1L3hCMnRxOGNTMy9iVcvaFNYUnl2ajE1czYrUDQxTDVUUnZDZz0=) (<https://sciprofiles.com/profile/author/MmhqTWM1L3hCMnRxOGNTMy9iVcvaFNYUnl2ajE1czYrUDQxTDVUUnZDZz0=>) [Aliyah Dosani](https://sciprofiles.com/profile/811652) (<https://sciprofiles.com/profile/811652>),  [Nicole Letourneau](https://sciprofiles.com/profile/1448120) (<https://sciprofiles.com/profile/1448120>), [Ilona S. Yim](https://sciprofiles.com/profile/1266152) (<https://sciprofiles.com/profile/1266152>),  [Shireen Shehzad Bhamani](https://sciprofiles.com/profile/2560596) (<https://sciprofiles.com/profile/2560596>) and [MIGHT \(Maternal-Infant Global Health Team—Collaborators in Research\)](https://sciprofiles.com/profile/author/T3FHVGhwSC9SOGFvNdd1VV) (<https://sciprofiles.com/profile/author/T3FHVGhwSC9SOGFvNdd1VV>)*Int. J. Environ. Res. Public Health* **2020**, *17*(19), 7295; <https://doi.org/10.3390/ijerph17197295> (<https://doi.org/10.3390/ijerph17197295>) - 06 Oct 2020
Cited by 10 ([/1660-4601/17/19/7295#metrics](#)) | Viewed by 2166**Abstract** Anxiety and depression commonly co-occur during pregnancy and may increase risk of poor birth outcomes including preterm birth and low birth weight. Our understanding of rates, patterns, and predictors of comorbid anxiety and depression is hindered given the dearth of literature, particularly in [...] [Read more](#).(This article belongs to the Special Issue [Early Fetal Environment to Infancy: Setting the Stage for Lifelong Health](#) (/journal/ijerph/special_issues/fetal_infancy))**Illicit Tobacco in Lithuania: A Cross-Sectional Survey** ([/1660-4601/17/19/7291](#))by  [Vaida Liutkutė-Gumarov](https://sciprofiles.com/profile/395469) (<https://sciprofiles.com/profile/395469>),  [Lukas Galkus](https://sciprofiles.com/profile/1091689) (<https://sciprofiles.com/profile/1091689>), [Janina Petkevičienė](https://sciprofiles.com/profile/803742) (<https://sciprofiles.com/profile/803742>),  [Mindaugas Štelemėkas](https://sciprofiles.com/profile/917750) (<https://sciprofiles.com/profile/917750>), [Laura Miščikienė](https://sciprofiles.com/profile/1238835) (<https://sciprofiles.com/profile/1238835>),  [Aušra Mickevičienė](https://sciprofiles.com/profile/2185014) (<https://sciprofiles.com/profile/2185014>) and [Justina Vaitkevičiūtė](https://sciprofiles.com/profile/566927) (<https://sciprofiles.com/profile/566927>)*Int. J. Environ. Res. Public Health* **2020**, *17*(19), 7291; <https://doi.org/10.3390/ijerph17197291> (<https://doi.org/10.3390/ijerph17197291>) - 06 Oct 2020
Cited by 3 ([/1660-4601/17/19/7291#metrics](#)) | Viewed by 1875**Abstract** Taxation policies are the most cost-effective measure to reduce overall tobacco consumption. However, cigarettes in Lithuania are among the cheapest in the European Union. The threat of the illicit trade is often used to compromise evidence-based policies, pricing policies particularly. The aim of [...] [Read more](#).(This article belongs to the Special Issue [Smoking Prevention and Tobacco Control](#) (/journal/ijerph/special_issues/smoking_prevention))**Effects of Inhaled Corticosteroids and Particle Size on Risk of Obstructive Sleep Apnea: A Large Retrospective Cohort Study** ([/1660-4601/17/19/7287](#))

by [Maria Paula Henao \(https://sciprofiles.com/profile/1196282\)](https://sciprofiles.com/profile/1196282),
[Jenniffer L. Kraschnewski \(https://sciprofiles.com/profile/author/d1V4NDhtVnFGL3VYSzJSaE1OUkJNL0E0UGtMbFpwYWNmNmlKeVVCajVxUjg\)](https://sciprofiles.com/profile/author/d1V4NDhtVnFGL3VYSzJSaE1OUkJNL0E0UGtMbFpwYWNmNmlKeVVCajVxUjg)

[Matthew D. Bolton \(https://sciprofiles.com/profile/1283348\)](https://sciprofiles.com/profile/1283348), [\(\(toggle_desktop_layout_cookie\)\)](#)  
[Faoud Ishmael \(https://sciprofiles.com/profile/author/WWwvNi8zRXkvdFBsaldiRfDQRIFLVEw0ODFtb2kvQmtZWUw4SHBUZDIOD0=\)](https://sciprofiles.com/profile/author/WWwvNi8zRXkvdFBsaldiRfDQRIFLVEw0ODFtb2kvQmtZWUw4SHBUZDIOD0=) and
[Timothy Craig \(https://sciprofiles.com/profile/586208\)](https://sciprofiles.com/profile/586208)

Int. J. Environ. Res. Public Health **2020**, *17*(19), 7287; <https://doi.org/10.3390/ijerph17197287> (<https://doi.org/10.3390/ijerph17197287>) - 06 Oct 2020
Cited by [2 \(1660-4601/17/19/7287#metrics\)](#) | Viewed by 2449

Abstract Background: Inhaled corticosteroids (ICS) produce local effects on upper airway dilators that could increase the risk of developing obstructive sleep apnea (OSA). Given that the particle size of ICS changes their distribution, the particle size of ICS may impact the risk of developing [...]. [Read more.](#)

(This article belongs to the Special Issue [Advances in Asthma \(/journal/ijerph/special_issues/advances_asthma\)](#).)

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Exploring the Intersection between Social Determinants of Health and Unmet Dental Care Needs Using Deep Learning (/1660-4601/17/19/7286)

by [Man Hung \(https://sciprofiles.com/profile/1106044\)](https://sciprofiles.com/profile/1106044),
[Eric S. Hon \(https://sciprofiles.com/profile/author/c0lzWXo0L1Q5Z1VKZVBFYWhSU2t4UjJUy9tdjhHY3d5bzFtYmtjeUpxZz0=\)](https://sciprofiles.com/profile/author/c0lzWXo0L1Q5Z1VKZVBFYWhSU2t4UjJUy9tdjhHY3d5bzFtYmtjeUpxZz0=),
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[Jungweon Park \(https://sciprofiles.com/profile/author/cktsdkJNMENBbEnvSINibUk5TmdIOFNTTkn6UUc1NXlzbFNZVjhxV0Q4bz0=\)](https://sciprofiles.com/profile/author/cktsdkJNMENBbEnvSINibUk5TmdIOFNTTkn6UUc1NXlzbFNZVjhxV0Q4bz0=),
[David Prince \(https://sciprofiles.com/profile/1273367\)](https://sciprofiles.com/profile/1273367), [Joseph Cheever \(https://sciprofiles.com/profile/2144825\)](https://sciprofiles.com/profile/2144825) and
[Frank W. Licari \(https://sciprofiles.com/profile/author/S2IDTWtsQUZkNHdZK00vV0lzd2dJYkRjB01qakxzNEtkL3Z2aVJRN1BXWT0=\)](https://sciprofiles.com/profile/author/S2IDTWtsQUZkNHdZK00vV0lzd2dJYkRjB01qakxzNEtkL3Z2aVJRN1BXWT0=)

Int. J. Environ. Res. Public Health **2020**, *17*(19), 7286; <https://doi.org/10.3390/ijerph17197286> (<https://doi.org/10.3390/ijerph17197286>) - 06 Oct 2020
Cited by [7 \(1660-4601/17/19/7286#metrics\)](#) | Viewed by 2204




Abstract The goals of this study were to develop a risk prediction model in unmet dental care needs and to explore the intersection between social determinants of health and unmet dental care needs in the United States. Data from the 2016 Medical Expenditure Panel [...]. [Read more.](#)

(This article belongs to the Special Issue [Research on Oral Health Outcomes \(/journal/ijerph/special_issues/oral_health_outcomes\)](#).)

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Awareness of Locomotive Syndrome and Factors Associated with Awareness: A Community-Based Cross-Sectional Study (/1660-4601/17/19/7272)

by [Keiko Sugai \(https://sciprofiles.com/profile/1105379\)](https://sciprofiles.com/profile/1105379), [Haruhiko Imamura \(https://sciprofiles.com/profile/167203\)](https://sciprofiles.com/profile/167203),
[Takehiro Michikawa \(https://sciprofiles.com/profile/2398504\)](https://sciprofiles.com/profile/2398504), [Keiko Asakura \(https://sciprofiles.com/profile/986900\)](https://sciprofiles.com/profile/986900) and
[Yuji Nishiwaki \(https://sciprofiles.com/profile/author/b1BTL3VQNmlac0owMUERtVo5eXB0SjJUTWszL3NMT2lxUmgxeHdXOUikOGpPN0ItaE13Z\)](https://sciprofiles.com/profile/author/b1BTL3VQNmlac0owMUERtVo5eXB0SjJUTWszL3NMT2lxUmgxeHdXOUikOGpPN0ItaE13Z)

Int. J. Environ. Res. Public Health **2020**, *17*(19), 7272; <https://doi.org/10.3390/ijerph17197272> (<https://doi.org/10.3390/ijerph17197272>) - 05 Oct 2020
Cited by [1 \(1660-4601/17/19/7272#metrics\)](#) | Viewed by 1550




Abstract Locomotive syndrome is a condition of reduced mobility, and patients have a high risk of requiring nursing care. In order to investigate the level of awareness of the term “locomotive syndrome” and the factors relating to awareness in a community, awareness of locomotive [...]. [Read more.](#)

(This article belongs to the Collection [Aging and Public Health \(/journal/ijerph/topical_collections/health_aging\)](#).)

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Factors Associated with E-Cigarette Use in U.S. Young Adult Never Smokers of Conventional Cigarettes: A Machine Learning Approach (/1660-4601/17/19/7271)

by [Nkiruka C. Atuegwu \(https://sciprofiles.com/profile/671490\)](https://sciprofiles.com/profile/671490),
[Cheryl Oncken \(https://sciprofiles.com/profile/author/dk5IYW5oc0ZxUXNaWm1XaWEXUmltdz09\)](https://sciprofiles.com/profile/author/dk5IYW5oc0ZxUXNaWm1XaWEXUmltdz09),
[Reinhard C. Laubenbacher \(https://sciprofiles.com/profile/author/UTNIVkVKR1hpck40dFpaZXliSXZUjdsOVFCR2dBY0xyZW92N0dMUTA3NmI\)](https://sciprofiles.com/profile/author/UTNIVkVKR1hpck40dFpaZXliSXZUjdsOVFCR2dBY0xyZW92N0dMUTA3NmI)

[Mario F. Perez \(https://sciprofiles.com/profile/835995\)](https://sciprofiles.com/profile/835995) and [Eric M. Mortensen \(https://sciprofiles.com/profile/673804\)](https://sciprofiles.com/profile/673804)
Int. J. Environ. Res. Public Health **2020**, *17*(19), 7271; <https://doi.org/10.3390/ijerph17197271> (<https://doi.org/10.3390/ijerph17197271>) - 05 Oct 2020
Cited by [6 \(1660-4601/17/19/7271#metrics\)](#) | Viewed by 2027

Abstract E-cigarette use is increasing among young adult never smokers of conventional cigarettes, but the awareness of the factors associated with e-cigarette use in this population is limited. The goal of this work was to use machine learning (ML) algorithms to determine the factors [...]. [Read more.](#)

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[Leveraging the Food System in the Eastern Mediterranean Region for Better Health and Nutrition: A Case Study from Oman \(/1660-4601/17/19/7250/\)](#)

by [Ayoub Al-Jawaldeh \(https://sciprofiles.com/profile/367860/\)](#),

[Salima Almamary \(https://sciprofiles.com/profile/author/Y2RIMEJxQ0pYc2tmMjF5TEpSQzdWS2Z6MWd0eIZJQVpEQzZwKytsK3BjTT0=\)](#),

[Lamia Mahmoud \(https://sciprofiles.com/profile/author/WdC4URBbGgycDJtMVNjS1NMTGIbzlLaHdDOXA3UIZwZ05OSXIR3pDRT0=\)](#), and

[Lara Nasreddine \(https://sciprofiles.com/profile/854963/\)](#)

Int. J. Environ. Res. Public Health **2020**, *17*(19), 7250; <https://doi.org/10.3390/ijerph17197250> (<https://doi.org/10.3390/ijerph17197250>) - 04 Oct 2020

Cited by 4 (/1660-4601/17/19/7250#metrics) | Viewed by 3761

Abstract The adoption of a food system approach is vital for the Eastern Mediterranean Region (EMR) in achieving the 2030 Agenda. The objective of this paper is to present a case-study from Oman, where a roadmap of context-specific entry points within the food system [...][Read more.](#)

(This article belongs to the Special Issue [Food Systems, Food Environment, Diet and Nutrition Related Diseases \(/journal/ijerph/special_issues/nutrition_disease/\)](#))

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[Racial/Ethnic Differences in Health Behaviors and Its Roles on Depressive Symptoms among Young Female Adults \(/1660-4601/17/19/7202/\)](#)

by [Jaewon Lee \(https://sciprofiles.com/profile/1401922/\)](#) and [Jisuk Seon \(https://sciprofiles.com/profile/1239282/\)](#)

Int. J. Environ. Res. Public Health **2020**, *17*(19), 7202; <https://doi.org/10.3390/ijerph17197202> (<https://doi.org/10.3390/ijerph17197202>) - 01 Oct 2020

Cited by 1 (/1660-4601/17/19/7202#metrics) | Viewed by 1277

Abstract This study explores the role of health behaviors on depressive symptoms across young adult females and differences in the relationship across race/ethnicity. The data come from the National Longitudinal Survey of Youth 1979 Child and Young Adult. Seven hundred and seven non-Hispanic White [...][Read more.](#)

(This article belongs to the Section [Health Behavior, Chronic Disease and Health Promotion \(/journal/ijerph/sections/health_promotion/\)](#))

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[Strategies to Connect Low-Income Communities with the Proposed Sewerage Network of the Dhaka Sanitation Improvement Project, Bangladesh: A Qualitative Assessment of the Perspectives of Stakeholders \(/1660-4601/17/19/7201/\)](#)

by [Mahbub-UI Alam \(https://sciprofiles.com/profile/869267/\)](#), [Fazle Sharior \(https://sciprofiles.com/profile/1273894/\)](#),

[Sharika Ferdous \(https://sciprofiles.com/profile/1275867/\)](#), [Atik Ahsan \(https://sciprofiles.com/profile/879790/\)](#),

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[Ayesha Afrin \(https://sciprofiles.com/profile/author/NkIlMkHmS0pFWW9SUHBydnZFWVIBdW0wM05xS0g3TFMvSDIxM3JtM1NJTT0=\)](#),

[Supta Sarker \(https://sciprofiles.com/profile/author/eIBiM2RYbWpMODhxKytKMKiYSVZ5b2pWWURUNDNrvTVpkdnB6Qk9zYzd3TT0=\)](#),

[Farhana Akand \(https://sciprofiles.com/profile/author/UzRYNWY5cmdBOVoyZ09XOWtRWIdDajlzUIVXQXl2VIM2UHF4dy9FSW5END0=\)](#),

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[Kamrul Hasan \(https://sciprofiles.com/profile/author/aXd1dXMydks1Y0xRbGpqqdFZadkNMTIiWTjBqNHRyQ1dXSCtqMk5QRDZQMD0=\)](#),

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Int. J. Environ. Res. Public Health **2020**, *17*(19), 7201; <https://doi.org/10.3390/ijerph17197201> (<https://doi.org/10.3390/ijerph17197201>) - 01 Oct 2020

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Abstract In Bangladesh, approximately 31% of urban residents are living without safely managed sanitation, the majority of whom are slum residents. To improve the situation, Dhaka Water Supply and Sewerage Authority (DWASA) is implementing the Dhaka Sanitation Improvement Project (DSIP), mostly funded by the [...][Read more.](#)



(This article belongs to the Special Issue [The World in Crisis: Current Health Issues \(/journal/ijerph/special_issues/world_crisis/\)](#))

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Health Behaviors and Health Status among Middle-Aged and Older Adults with Chronic Diseases in Taiwan [\(/1660-4601/17/19/7196\)](https://doi.org/10.3390/ijerph17197196)   

by  [Wei-Hua Tian \(https://sciprofiles.com/profile/1176308\)](https://sciprofiles.com/profile/1176308) and

 [Joseph J. Tien \(https://sciprofiles.com/profile/author/bGIQNEQxMnNTL0NseE81c0RZTG50RDNma0dMZmVDYnNtRHNNK0tqUUYzVT0=\)](https://sciprofiles.com/profile/author/bGIQNEQxMnNTL0NseE81c0RZTG50RDNma0dMZmVDYnNtRHNNK0tqUUYzVT0=)



Int. J. Environ. Res. Public Health **2020**, *17*(19), 7196; <https://doi.org/10.3390/ijerph17197196> (<https://doi.org/10.3390/ijerph17197196>) - 01 Oct 2020

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Abstract Changes in lifestyle behaviors may effectively maintain or improve the health status of individuals with chronic diseases. However, such health behaviors adopted by individuals are unlikely to demonstrate similar patterns. This study analyzed the relationship between the heterogeneous latent classes of health behavior [...]. [Read more.](#)

(This article belongs to the Collection [Health Behaviors, Risk Factors, NCDs and Health Promotion](#) ([/journal/ijerph/topical_collections/TC_health_behaviors](#)))

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The Association between Insulin Resistance and Cardiovascular Disease Risk: A Community-Based Cross-Sectional Study among Taiwanese People Aged over 50 Years [\(/1660-4601/17/19/7195\)](https://doi.org/10.3390/ijerph17197195)

by  [Mei-Chun Lu \(https://sciprofiles.com/profile/1264346\)](https://sciprofiles.com/profile/1264346),

 [Wei-Ching Fang \(https://sciprofiles.com/profile/author/cm0yV2VzaDBYU0hPZ2FPY3FSaVdlLzZPMGpydnJNz3hzM2MxaDNLbVlxcz0=\)](https://sciprofiles.com/profile/author/cm0yV2VzaDBYU0hPZ2FPY3FSaVdlLzZPMGpydnJNz3hzM2MxaDNLbVlxcz0=),

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Int. J. Environ. Res. Public Health **2020**, *17*(19), 7195; <https://doi.org/10.3390/ijerph17197195> (<https://doi.org/10.3390/ijerph17197195>) - 01 Oct 2020

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Abstract Background and Aims: Previous studies have implied that insulin resistance (IR) could represent a major underlying abnormality leading to cardiovascular disease (CVD). The aim of this study was to evaluate the relationships between IR (estimated by the homeostasis model assessment of IR (HOMA-IR) [...]). [Read more.](#)

(This article belongs to the Special Issue [Towards a Public Health Wellness: Psychosocial & Physical Health in Community](#) ([/journal/ijerph/special_issues/Psychosocial_Physical](#)))

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Prognostic Factors for Staying at Work for Partially Sick-Listed Workers with Subjective Health Complaints: A Prospective Cohort Study [\(/1660-4601/17/19/7184\)](https://doi.org/10.3390/ijerph17197184)

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Int. J. Environ. Res. Public Health **2020**, *17*(19), 7184; <https://doi.org/10.3390/ijerph17197184> (<https://doi.org/10.3390/ijerph17197184>) - 30 Sep 2020
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Abstract Examination of prognostic factors for staying at work for long-term sick-listed workers with subjective health complaints (SHC) who partially work in a paid job, and to evaluate whether these factors are comparable with those of workers with other disorders. We used data of [...]. [Read more.](#)

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The Adoption of Preventive Behaviors during the COVID-19 Pandemic in China and Israel [\(/1660-4601/17/19/7170\)](https://doi.org/10.3390/ijerph17197170)

by  [Xue-Jing Liu \(https://sciprofiles.com/profile/author/MWhGUE1uV09xcDJFQld6ekM1Z1pIbE0rZVQxdjBjVnJ6U3VINIZ0Y2JwRT0=\)](https://sciprofiles.com/profile/author/MWhGUE1uV09xcDJFQld6ekM1Z1pIbE0rZVQxdjBjVnJ6U3VINIZ0Y2JwRT0=) and

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Int. J. Environ. Res. Public Health **2020**, *17*(19), 7170; <https://doi.org/10.3390/ijerph17197170> (<https://doi.org/10.3390/ijerph17197170>) - 30 Sep 2020

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Abstract The COVID-19 pandemic represents a massive global health crisis. The rapid transmission rate of the virus, as well as the lack of effective medications and vaccines, has posed serious challenges to controlling the spread of the disease. Dealing with this public health crisis [...] [Read more.](#) (This article belongs to the Section [Health Behavior, Chronic Disease and Health Promotion \(/journal/ijerph/sections/health_promotion/\)](#))

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Validity and Reliability of International Physical Activity Questionnaires for Adults across EU Countries: Systematic Review and Meta Analysis (/1660-4601/17/19/7161)

by [Vedrana Sember](https://sciprofiles.com/profile/682276) (<https://sciprofiles.com/profile/682276>), [Kaja Meh](https://sciprofiles.com/profile/1261414) (<https://sciprofiles.com/profile/1261414>),

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[Gregor Jurak](https://sciprofiles.com/profile/1263279) (<https://sciprofiles.com/profile/1263279>)

Int. J. Environ. Res. Public Health **2020**, *17*(19), 7161; <https://doi.org/10.3390/ijerph17197161> (<https://doi.org/10.3390/ijerph17197161>) - 30 Sep 2020

Cited by 42 (/1660-4601/17/19/7161#metrics) | Viewed by 5212

Abstract This review and meta-analysis (PROSPERO registration number: CRD42020138845) critically evaluates test-retest reliability, concurrent validity and criterion validity of different physical activity (PA) levels of three most commonly used international PA questionnaires (PAQs) in official language versions of European Union (EU): International Physical Activity [...] [Read more.](#)

(This article belongs to the Special Issue [Measurement and Evaluation in Physical Education, Physical Activity and Sports \(/journal/ijerph/special_issues/evaluation_sports/\)](#))

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Psychosocial Experiences of HIV-Positive Women of African Descent in the Cultural Context of Infant Feeding: A Three-Country Comparative Analyses (/1660-4601/17/19/7150)

by [Josephine Etowa](https://sciprofiles.com/profile/1227627) (<https://sciprofiles.com/profile/1227627>), [Hilary Nare](https://sciprofiles.com/profile/1211039) (<https://sciprofiles.com/profile/1211039>),

[Doris M. Kakuru](https://sciprofiles.com/profile/1211040) (<https://sciprofiles.com/profile/1211040>) and [Egbe B. Etowa](https://sciprofiles.com/profile/1211038) (<https://sciprofiles.com/profile/1211038>)

Int. J. Environ. Res. Public Health **2020**, *17*(19), 7150; <https://doi.org/10.3390/ijerph17197150> (<https://doi.org/10.3390/ijerph17197150>) - 29 Sep 2020

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Abstract Infant feeding among mothers of African descent living with Human Immunodeficiency Virus (HIV) is a critical practice that is influenced by policies, cultural expectations, and the resultant psychosocial state of the mother. Hence, this paper draws insights from a broader infant feeding study. [...] [Read more.](#)

(This article belongs to the Special Issue [Early Fetal Environment to Infancy: Setting the Stage for Lifelong Health \(/journal/ijerph/special_issues/fetal_infancy/\)](#))

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Racial Differences in Perceived Food Swamp and Food Desert Exposure and Disparities in Self-Reported Dietary Habits (/1660-4601/17/19/7143)

by [Kristen Cooksey Stowers](https://sciprofiles.com/profile/283897) (<https://sciprofiles.com/profile/283897>), [Qianxia Jiang](https://sciprofiles.com/profile/356562) (<https://sciprofiles.com/profile/356562>),

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[Kim Gans](https://sciprofiles.com/profile/1211840) (<https://sciprofiles.com/profile/1211840>)

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Abstract Both food swamps and food deserts have been associated with racial, ethnic, and socioeconomic disparities in obesity rates. Little is known about how the distribution of food deserts and food swamps relate to disparities in self-reported dietary habits, and health status, particularly for [...] [Read more.](#)

(This article belongs to the Special Issue [Food Systems, Food Environment, Diet and Nutrition Related Diseases \(/journal/ijerph/special_issues/nutrition_disease/\)](#))

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Acculturation Associated with Sleep Duration, Sleep Quality, and Sleep Disorders at the US–Mexico Border (/1660-4601/17/19/7138)

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[Marcos E. Delgadillo](https://sciprofiles.com/profile/author/YTREUnh4dkivTjJRUC9ldHpoaUZjNHh4aGVDd09URGYwbVBZRHIZd0tBdz0=) (<https://sciprofiles.com/profile/author/YTREUnh4dkivTjJRUC9ldHpoaUZjNHh4aGVDd09URGYwbVBZRHIZd0tBdz0=>),

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[Pamela Alfonso-Miller](https://sciprofiles.com/profile/author/a1BkcW4rdZyaFA1aFYzWm5nTGRPVIJhakytMmtWbXVBcFJNU2ExTjJ5OD0=) (<https://sciprofiles.com/profile/author/a1BkcW4rdZyaFA1aFYzWm5nTGRPVIJhakytMmtWbXVBcFJNU2ExTjJ5OD0=>),

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[Sairam Parthasarathy](https://sciprofiles.com/profile/943370) (<https://sciprofiles.com/profile/943370>),
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[Patricia Molina](https://sciprofiles.com/profile/author/TytFSitZeFY5a0pSUNlramd0MINZakdTcDJQbXlrTHIYd1c4TEVDTTB6MD0=) (<https://sciprofiles.com/profile/author/TytFSitZeFY5a0pSUNlramd0MINZakdTcDJQbXlrTHIYd1c4TEVDTTB6MD0=>),
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[Girardin Jean-Louis](https://sciprofiles.com/profile/1232686) (<https://sciprofiles.com/profile/1232686>) and [Michael A. Grandner](https://sciprofiles.com/profile/1016222) (<https://sciprofiles.com/profile/1016222>)
Int. J. Environ. Res. Public Health **2020**, *17*(19), 7138; <https://doi.org/10.3390/ijerph17197138> (<https://doi.org/10.3390/ijerph17197138>) - 29 Sep 2020
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Abstract Sleep disparities exist among Hispanics/Latinos, although little work has characterized individuals at the United States (US)–Mexico border, particularly as it relates to acculturation. This study examined the association of Anglo and Mexican acculturation to various facets of sleep health among those of Mexican [...]
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(This article belongs to the Special Issue [Sleep, Sleep Disorders and Public Health \(/journal/ijerph/special_issues/sleep_disorders_health\)](#))

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[Experiences of Mothers Facing the Prognosis of Their Children with Complex Congenital Heart Disease \(/1660-4601/17/19/7134\)](#)

by [Sunhee Lee](https://sciprofiles.com/profile/1271733) (<https://sciprofiles.com/profile/1271733>) and [Jeong-Ah Ahn](https://sciprofiles.com/profile/1130677) (<https://sciprofiles.com/profile/1130677>)
Int. J. Environ. Res. Public Health **2020**, *17*(19), 7134; <https://doi.org/10.3390/ijerph17197134> (<https://doi.org/10.3390/ijerph17197134>) - 29 Sep 2020
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Abstract Mothers of children with complex congenital heart disease face unique challenges and emotional burdens, while their children go through physical and psychological difficulties during disease progression. In this study, we aimed to explore the in-depth experiences and feelings of mothers facing the prognosis [...]
Read more.

(This article belongs to the Section [Health Behavior, Chronic Disease and Health Promotion \(/journal/ijerph/sections/health_promotion\)](#))

Open Access Article  [./1660-4601/17/19/7096/pdf?version=1601277331](#)

[Trends of Alcohol Use, Dietary Behaviour, Interpersonal Violence, Mental Health, Oral and Hand Hygiene Behaviour among Adolescents in Lebanon: Cross-Sectional National School Surveys from 2005, 2011 and 2017 \(/1660-4601/17/19/7096\)](#)

by [Supa Pengpid](https://sciprofiles.com/profile/8779) (<https://sciprofiles.com/profile/8779>) and [Karl Peltzer](https://sciprofiles.com/profile/14682) (<https://sciprofiles.com/profile/14682>)
Int. J. Environ. Res. Public Health **2020**, *17*(19), 7096; <https://doi.org/10.3390/ijerph17197096> (<https://doi.org/10.3390/ijerph17197096>) - 28 Sep 2020
Cited by 4 ([/1660-4601/17/19/7096#metrics](#)) | Viewed by 1468

Abstract Health risk behaviours during adolescence can have long-term negative consequences. Little is known, however, about the recent health risk behaviour trends in adolescents in Lebanon. This investigation aimed to report the trends in the prevalence of various health risk behaviours, such as alcohol [...]
Read more.

(This article belongs to the Section [Health Behavior, Chronic Disease and Health Promotion \(/journal/ijerph/sections/health_promotion\)](#))

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[Psychometric Properties of the Persian Pittsburgh Sleep Quality Index for Adolescents \(/1660-4601/17/19/7095\)](#)

by [Azita Chehri](https://sciprofiles.com/profile/author/b0pkZwJvZDh4bnNwanZOREM5N3lpMms0UTI0L2IDRmRkeTU3V0lhNGFnOD0=) (<https://sciprofiles.com/profile/author/b0pkZwJvZDh4bnNwanZOREM5N3lpMms0UTI0L2IDRmRkeTU3V0lhNGFnOD0=>),
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Int. J. Environ. Res. Public Health **2020**, *17*(19), 7095; <https://doi.org/10.3390/ijerph17197095> (<https://doi.org/10.3390/ijerph17197095>) - 28 Sep 2020
Cited by 10 ([/1660-4601/17/19/7095#metrics](#)) | Viewed by 1955

Abstract Background: Both cross-sectional and longitudinal studies show that poor sleep is a health concern related to further psychological and physiological issues during adolescence. To assess subjective sleep quality and sleep patterns among adults, the Pittsburgh Sleep Quality Index (PSQI) is a well and [...]
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[Ultimate Full Contact: Fight Outcome Characterization Concerning Their Methods, Occurrence Times and Technical–Tactical Developments \(/1660-4601/17/19/7094\)](#)

by [Fernando C. Loio Pinto](https://sciprofiles.com/profile/1286075) (<https://sciprofiles.com/profile/1286075>), [Henrique Neiva](https://sciprofiles.com/profile/594625) (<https://sciprofiles.com/profile/594625>),
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Int. J. Environ. Res. Public Health **2020**, *17*(19), 7094; <https://doi.org/10.3390/ijerph17197094> (<https://doi.org/10.3390/ijerph17197094>) - 28 Sep 2020
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Abstract Fight analysis produces relevant technical–tactical information. However, this knowledge is limited in hybrid full-contact combat sports. Therefore, this study aimed to characterize the results of the fights' outcomes through the winners at the World Ultimate Full Contact (WUFC) Championships between 2008 and 2017. [...]
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(This article belongs to the Special Issue **Monitoring and Evaluation of Training in Sport and Exercise** ([/journal/ijerph/special_issues/monitoring_evaluation](https://journal/ijerph/special_issues/monitoring_evaluation)))

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Model Construction for Undergraduate Student College Adjustment ([/1660-4601/17/19/7090](https://doi.org/10.3390/ijerph17197090))

by  [Sona Lee](https://sciprofiles.com/profile/1270271) (<https://sciprofiles.com/profile/1270271>), and  [Hye Young Ahn](https://sciprofiles.com/profile/1151906) (<https://sciprofiles.com/profile/1151906>)

Int. J. Environ. Res. Public Health **2020**, *17*(19), 7090; <https://doi.org/10.3390/ijerph17197090> (<https://doi.org/10.3390/ijerph17197090>) - 28 Sep 2020
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Abstract *Background:* College students are known to struggle with a number of difficulties, such as their future careers and interpersonal relationships, as well as job-seeking stress. This study aimed to develop and test a structural model for undergraduate student college adjustment. *Methods:* The [...] **Read more.**

(This article belongs to the Special Issue **Factors Associated with the Psychological Well-Being of University Students: A Preventive View** ([/journal/ijerph/special_issues/students_well_being](https://journal/ijerph/special_issues/students_well_being)))

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Preliminary Trajectories in Dietary Behaviors during the COVID-19 Pandemic: A Public Health Call to Action to Face Obesity ([/1660-4601/17/19/7073](https://doi.org/10.3390/ijerph17197073))

by  [Roberta Zupo](https://sciprofiles.com/profile/1586564) (<https://sciprofiles.com/profile/1586564>),

 [Fabio Castellana](https://sciprofiles.com/profile/author/MHdveVh1bEd4eIjvR1IOZlpEcHhSeE15ZWpURkw1NU00UEc1ejNVSm4vdz0=) (<https://sciprofiles.com/profile/author/MHdveVh1bEd4eIjvR1IOZlpEcHhSeE15ZWpURkw1NU00UEc1ejNVSm4vdz0=>),

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Int. J. Environ. Res. Public Health **2020**, *17*(19), 7073; <https://doi.org/10.3390/ijerph17197073> (<https://doi.org/10.3390/ijerph17197073>) - 27 Sep 2020

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Abstract The world is currently struggling to face the coronavirus pandemic (COVID-19), and many countries have imposed lockdowns and recommended quarantine to limit both the spread of the virus and overwhelming demands for medical care. Direct implications include the disruption of work routines, boredom, [...] **Read more.**

(This article belongs to the Special Issue **Nutrition Styles and Obesity** ([/journal/ijerph/special_issues/Nutrition_Styles_Obesity](https://journal/ijerph/special_issues/Nutrition_Styles_Obesity)))

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Comparison of Postural Sway, Plantar Cutaneous Sensation According to Saccadic Eye Movement Frequency in Young Adults ([/1660-4601/17/19/7067](https://doi.org/10.3390/ijerph17197067))

by  [Youngsook Bae](https://sciprofiles.com/profile/1139607) (<https://sciprofiles.com/profile/1139607>)

Int. J. Environ. Res. Public Health **2020**, *17*(19), 7067; <https://doi.org/10.3390/ijerph17197067> (<https://doi.org/10.3390/ijerph17197067>) - 27 Sep 2020

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Abstract The crossover trial study aimed to identify the saccadic eye movement (SEM) frequency to improve postural sway (PS) and plantar cutaneous sensation (PUS) in young adults. The 17 participants randomly performed 0.5-, 2-, and 3-Hz SEM. The SEM frequency was determined to allow [...] **Read more.**

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Downside: The Perpetrator of Violence in the Representations of Social and Health Professionals ([/1660-4601/17/19/7061](https://doi.org/10.3390/ijerph17197061))

by  [Fortuna Procentese](https://sciprofiles.com/profile/457432) (<https://sciprofiles.com/profile/457432>),  [Roberto Fasanelli](https://sciprofiles.com/profile/680146) (<https://sciprofiles.com/profile/680146>),

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 [Noemi Pisapia](https://sciprofiles.com/profile/1257454) (<https://sciprofiles.com/profile/1257454>),  [Caterina Arcidiacono](https://sciprofiles.com/profile/672527) (<https://sciprofiles.com/profile/672527>) and

 [Immacolata Di Napoli](https://sciprofiles.com/profile/794964) (<https://sciprofiles.com/profile/794964>)

Int. J. Environ. Res. Public Health **2020**, *17*(19), 7061; <https://doi.org/10.3390/ijerph17197061> (<https://doi.org/10.3390/ijerph17197061>) - 27 Sep 2020

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Abstract Gender-based violence is a widespread phenomenon and pandemic that affects women's lives. Many interventions have been activated for perpetrators, but the dropout rate is still high. In order to draw up guidelines for responsibly and sustainably dealing with the phenomenon, this study is [...] **Read more.**

(This article belongs to the Special Issue **Gender Violence Against Women: Prevention, Protection, Prosecution, Policies** ([/journal/ijerph/special_issues/women_violence](#).)



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Examining Older Adults' Perspectives on the Built Environment and Correlates of Healthy Aging in an American Age-Friendly Community ([/1660-4601/17/19/7056](#)).

by  **Kathy Black** (<https://sciprofiles.com/profile/1228803>), and  **Dylan J. Jester** (<https://sciprofiles.com/profile/1246556>)
Int. J. Environ. Res. Public Health **2020**, *17*(19), 7056; <https://doi.org/10.3390/ijerph17197056> (<https://doi.org/10.3390/ijerph17197056>) - 27 Sep 2020
Cited by 6 ([/1660-4601/17/19/7056#metrics](#)) | Viewed by 2154

Abstract Population aging has led to an increased focus on the environmental context in which we age. While researchers have identified significant health benefits associated with built community features such as housing, transportation and outdoor spaces and buildings, less attention has focused on the [...] **Read more.**

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Linking Mediterranean Diet and Lifestyle with Cardio Metabolic Disease and Depressive Symptoms: A Study on the Elderly in Europe ([/1660-4601/17/19/7053](#)).

by  **Judit Vall Castelló** (<https://sciprofiles.com/profile/1186498>) and  **Charisse Tubianosa** (<https://sciprofiles.com/profile/1221369>)
Int. J. Environ. Res. Public Health **2020**, *17*(19), 7053; <https://doi.org/10.3390/ijerph17197053> (<https://doi.org/10.3390/ijerph17197053>) - 26 Sep 2020
Cited by 7 ([/1660-4601/17/19/7053#metrics](#)) | Viewed by 2850

Abstract Against a backdrop of an aging population in Europe, promoting health in older adults becomes a pressing issue. This study aimed to explore if correlations exist between the adherence to the Mediterranean diet and specific health outcomes such as the incidence of chronic [...] **Read more.**

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Profiles of Problematic Internet Use in Bullying and Cyberbullying among Adolescents ([/1660-4601/17/19/7041](#)).

by  **Inmaculada Méndez** (<https://sciprofiles.com/profile/444538>),
 **Ana Belén Jorquera** (<https://sciprofiles.com/profile/author/WUswRTRobUxDtm9mMHBJK08veWJRMmRUekhLb0xCWFN0NWJiRzJpWIVtWT0=>)

 **Cecilia Ruiz Esteban** (<https://sciprofiles.com/profile/607206>) and  **José Manuel García-Fernández** (<https://sciprofiles.com/profile/879754>)
Int. J. Environ. Res. Public Health **2020**, *17*(19), 7041; <https://doi.org/10.3390/ijerph17197041> (<https://doi.org/10.3390/ijerph17197041>) - 26 Sep 2020
Cited by 4 ([/1660-4601/17/19/7041#metrics](#)) | Viewed by 2506

Abstract The rise of technology has increased risks such as problematic internet use or cyberbullying. Data show that there is problematic use of the internet, which has important repercussions academically, personally, socially and for health. The objective of this study was to identify different [...] **Read more.**

(This article belongs to the Special Issue **School Climate, Bullying, and School Violence** ([/journal/ijerph/special_issues/school_bullying](#).)






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Gender Differences in the Relationship between Type 2 Diabetes Mellitus and Employment: Evidence from the Korea Health Panel Study ([/1660-4601/17/19/7040](#)).

by  **Jeung-Hee Kim** (<https://sciprofiles.com/profile/1267725>),  **Weon-Young Lee** (<https://sciprofiles.com/profile/72270>),
 **Song Soo Lim** (<https://sciprofiles.com/profile/714141>),
 **Young Taek Kim** (<https://sciprofiles.com/profile/author/WDdjMk1BQUJDNuT5enkyTEtPmF3blpXUXh6S1JHYXhXejZqR2tXeFhNcz0=>) and
 **Yeon-Pyo Hong** (<https://sciprofiles.com/profile/1420604>)
Int. J. Environ. Res. Public Health **2020**, *17*(19), 7040; <https://doi.org/10.3390/ijerph17197040> (<https://doi.org/10.3390/ijerph17197040>) - 26 Sep 2020
Cited by 1 ([/1660-4601/17/19/7040#metrics](#)) | Viewed by 1338

Abstract Previous studies have analyzed the impact of diabetes mellitus on labor market participation by men and women, but gender difference between type 2 diabetes mellitus (T2DM) and employment has not been the focus. This study aims to explore gender differences between T2DM and [...] [Read more](#).

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Adaptation and Evaluation of the Nutrition Environment Measures Survey in Stores to Assess Mediterranean Food Environments (NEMS-S-MED). ([/1660-4601/17/19/7031](#))

by [Alba Martínez-García](#) (<https://sciprofiles.com/profile/651671>), [Julia Díez](#) (<https://sciprofiles.com/profile/532524>), [Carlos Fernández-Escobar](#) (<https://sciprofiles.com/profile/1266971>), [Eva María Trescastro-López](#) (<https://sciprofiles.com/profile/667371>), [Pamela Pereyra-Zamora](#) (<https://sciprofiles.com/profile/480166>), [Carles Ariza](#) (<https://sciprofiles.com/profile/1437166>), [Usama Bilal](#) (<https://sciprofiles.com/profile/749708>) and [Manuel Franco](#) (<https://sciprofiles.com/profile/386445>)

Int. J. Environ. Res. Public Health **2020**, *17*(19), 7031; <https://doi.org/10.3390/ijerph17197031> (<https://doi.org/10.3390/ijerph17197031>) - 25 Sep 2020
Cited by 8 ([/1660-4601/17/19/7031#metrics](#)) | Viewed by 2409

Abstract The Nutrition Environment Measures Surveys are valid and reliable measures of community and consumer food environments. This article describes the adaptation and evaluation of the Nutrition Environment Measures Survey in Stores (NEMS-S) for Mediterranean urban contexts (NEMS-S-MED). Trained raters used the adapted NEMS-S-MED [...] [Read more](#).

(This article belongs to the Special Issue [Food Systems, Food Environment, Diet and Nutrition Related Diseases](#) ([/journal/ijerph/special_issues/nutrition_disease](#)))

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Reorienting Nurturing Care for Early Childhood Development during the COVID-19 Pandemic in Kenya: A Review. ([/1660-4601/17/19/7028](#))

by [Constance Shumba](#) (<https://sciprofiles.com/profile/1191608>), [Rose Maina](#) (<https://sciprofiles.com/profile/1206703>), [Gladys Mbutia](#) (<https://sciprofiles.com/profile/author/L0NtL1dMR0I3cFZKc2IFVEJpNtHtOWZpazdKNXRBM25Qb2lmbHV6TGh0QT0=>), [Rachel Kimani](#) (<https://sciprofiles.com/profile/author/dWZ3YW0wa0FRSHU3aUU0ekpEWjVLaEpWcXJsYWRZSi9zbFpBR05sYzBVUT0=>), [Stella Mbugua](#) (<https://sciprofiles.com/profile/1207472>), [Sweta Shah](#) (<https://sciprofiles.com/profile/author/NCsyb0JhVlhJRMxkOUtZZ0t5SFA3YjRBZkUrNkF6V1hkdGdSWnVaQmIVWT0=>), [Amina Abubakar](#) (<https://sciprofiles.com/profile/2329182>), [Stanley Luchters](#) (<https://sciprofiles.com/profile/1910391>), [Sheila Shaibu](#) (<https://sciprofiles.com/profile/author/WURuNVphNVpFU0ZsS2FXL3IDMFpWSGJWVIUrc1p0L29uSURic1gyamIFZz0=>) and [Eunice Ndirangu](#) (<https://sciprofiles.com/profile/author/M01BZVVDY1hocDJZUIE5N3lvUk9aeXFEQgthWW5IRmw0ODEBdCu40ZXVQT0=>)

Int. J. Environ. Res. Public Health **2020**, *17*(19), 7028; <https://doi.org/10.3390/ijerph17197028> (<https://doi.org/10.3390/ijerph17197028>) - 25 Sep 2020
Cited by 11 ([/1660-4601/17/19/7028#metrics](#)) | Viewed by 7893

Abstract In Kenya, millions of children have limited access to nurturing care. With the Coronavirus disease 2019 (COVID-19) pandemic, it is anticipated that vulnerable children will bear the biggest brunt of the direct and indirect impacts of the pandemic. This review aimed to deepen [...] [Read more](#).

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Bone Mineral Density in Severely Obese Women: Health Risk and Health Protective Risk Factors in Three Different Bone Sites. ([/1660-4601/17/19/7017](#))

by [Camila Kellen de Souza Cardoso](#) (<https://sciprofiles.com/profile/931618>), [Maria do Rosário Gondim Peixoto](#) (<https://sciprofiles.com/profile/871421>), [Ana Paula dos Santos Rodrigues](#) (<https://sciprofiles.com/profile/1091720>), [Carolina Rodrigues Mendonça](#) (<https://sciprofiles.com/profile/1095135>), [Cesar de Oliveira](#) (<https://sciprofiles.com/profile/972410>) and [Erika Aparecida Silveira](#) (<https://sciprofiles.com/profile/1062372>)

Int. J. Environ. Res. Public Health **2020**, *17*(19), 7017; <https://doi.org/10.3390/ijerph17197017> (<https://doi.org/10.3390/ijerph17197017>) - 25 Sep 2020
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Abstract Factors associated with bone mineral density (BMD) are poorly known in severely obese individuals i.e., a body mass index (BMI) > 35 kg/m². The objectives of this study were to describe the bone health profile of severely obese Brazilian women, to [...] [Read more](#).

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Chronic Facial Pain: Trigeminal Neuralgia, Persistent Idiopathic Facial Pain, and Myofascial Pain Syndrome—An Evidence-Based Narrative Review and Etiological Hypothesis. ([/1660-4601/17/19/7012](#))

by [Robert Gerwin](#) (<https://sciprofiles.com/profile/64396>)

Int. J. Environ. Res. Public Health **2020**, *17*(19), 7012; <https://doi.org/10.3390/ijerph17197012> (<https://doi.org/10.3390/ijerph17197012>) - 25 Sep 2020
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Abstract Trigeminal neuralgia (TN), the most common form of severe facial pain, may be confused with an ill-defined persistent idiopathic facial pain (PIFP). Facial pain is reviewed and a detailed discussion of TN and PIFP is presented. A possible cause for PIFP is proposed. [...] [Read more](#).

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[Statistical Parametric Mapping Reveals Subtle Gender Differences in Angular Movements in Table Tennis Topspin Backhand](#) ([/1660-4601/17/19/6996](#))

by  [Ziemowit Bańkosz](https://sciprofiles.com/profile/1136760) (<https://sciprofiles.com/profile/1136760>), and  [Sławomir Winiarski](https://sciprofiles.com/profile/1442916) (<https://sciprofiles.com/profile/1442916>)
Int. J. Environ. Res. Public Health **2020**, *17*(19), 6996; <https://doi.org/10.3390/ijerph17196996> (<https://doi.org/10.3390/ijerph17196996>) - 24 Sep 2020
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Abstract *Background:* Statistical parametric mapping (SPM) is an innovative method based on the analysis of time series (data series) and is equivalent to statistical methods for numerical (discrete) data series. This study aimed to analyze the patterns of movement in the topspin backhand stroke [...]. [Read more.](#)

(This article belongs to the Special Issue [Measurement and Evaluation in Physical Education, Physical Activity and Sports](#) ([/journal/ijerph/special_issues/evaluation_sports](#)))







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[Relationship between Sprint Velocity and Peak Moment at Shoulder and Elbow in Elite Wheelchair Basketball Players](#) ([/1660-4601/17/19/6989](#))

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and
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Int. J. Environ. Res. Public Health **2020**, *17*(19), 6989; <https://doi.org/10.3390/ijerph17196989> (<https://doi.org/10.3390/ijerph17196989>) - 24 Sep 2020
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Abstract Specific wheelchair basketball (WB) skills on the court have been poorly analyzed in relation to improving players' performance according to their functional class. The purpose of this study was to evaluate the associations between maximum velocity (Vmax) and peak moment (PM) in the [...]. [Read more.](#)

(This article belongs to the Special Issue [New Trends in Research on Training, Performance, Conditioning, Coaching, Evaluation and Health in Basketball](#) ([/journal/ijerph/special_issues/basketball_health](#)))



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[The Predictive Role of Affectivity, Self-Esteem and Social Support in Depression and Anxiety in Children and Adolescents](#) ([/1660-4601/17/19/6984](#))

by  [Wenceslao Peñate](https://sciprofiles.com/profile/1190198) (<https://sciprofiles.com/profile/1190198>),  [Melissa González-Loyola](https://sciprofiles.com/profile/1264868) (<https://sciprofiles.com/profile/1264868>) and
 [Cristian Oyanadel](https://sciprofiles.com/profile/1180821) (<https://sciprofiles.com/profile/1180821>)
Int. J. Environ. Res. Public Health **2020**, *17*(19), 6984; <https://doi.org/10.3390/ijerph17196984> (<https://doi.org/10.3390/ijerph17196984>) - 24 Sep 2020
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Abstract *Background:* This study analyzes the relationship between depression and anxiety levels and positive and negative affect, self-esteem, and perceived social support from family and friends in an early and middle adolescent sample. These are psychological variables that are often associated with the prediction [...]. [Read more.](#)

(This article belongs to the Special Issue [Adolescent Depressive Disorder](#) ([/journal/ijerph/special_issues/adolescent_depression](#)))

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[Barriers and Facilitators in the Strengthening Families Program \(SFP 10–14\) Implementation Process in Northeast Brazil: A Retrospective Qualitative Study](#) ([/1660-4601/17/19/6979](#))

by [Ingrid Gomes Abdala](https://sciprofiles.com/profile/1170035) (<https://sciprofiles.com/profile/1170035>), [Sheila Giardini Murta](https://sciprofiles.com/profile/1169982) (<https://sciprofiles.com/profile/1169982>), [Jordana Calil Lopes de Menezes](https://sciprofiles.com/profile/1247807) (<https://sciprofiles.com/profile/1247807>), [Larissa de Almeida Nobre-Sandoval](https://sciprofiles.com/profile/1252613) (<https://sciprofiles.com/profile/1252613>), [Maria do Socorro Mendes Gomes](https://sciprofiles.com/profile/author/SzhzNEZLds9VbjVNMFNWSHps2Wp9pb-dm400-jawu-t02261QFEXRW) (<https://sciprofiles.com/profile/author/SzhzNEZLds9VbjVNMFNWSHps2Wp9pb-dm400-jawu-t02261QFEXRW>)

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Abstract This study analyzed contextual barriers and facilitators in the implementation of Strengthening Families Program (SFP 10–14), Brazilian version, a family-based preventive program focused on the prevention of risk behaviors for adolescent health. SFP 10–14 was implemented between 2016 and 2017 for socioeconomically vulnerable [...] [Read more.](#)

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Nutrition Education Intervention Increases Fish Consumption among School Children in Indonesia: Results from Behavioral Based Randomized Control Trial ([/1660-4601/17/19/6970](#))

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Abstract This study aimed to analyze the effectiveness of behavioral-based nutrition education to increase fish consumption among school children using a raised bed pool. This was a randomized control trial study with a 3-months nutrition education intervention using a raised bed pool, as a [...] [Read more.](#)
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Fatherhood and Smoking Problems in Indonesia: Exploration of Potential Protective Factors for Men Aged 18–49 Years from the United Nations Multi-Country Study on Men and Violence ([/1660-4601/17/19/6965](#))

by [Nurul Kodriati](https://sciprofiles.com/profile/author/cnhlKzJ1aUx2TW5YYXJIUudl0JuUXpYcHp6NVVsOVERt0JwTnpMd3l5cz0=) (<https://sciprofiles.com/profile/author/cnhlKzJ1aUx2TW5YYXJIUudl0JuUXpYcHp6NVVsOVERt0JwTnpMd3l5cz0=>),

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Abstract Background: Despite the sustained high prevalence of smoking among Indonesian adult men, little is known about possible protective factors in this group. This study examined the relationship between key characteristics of masculinity (e.g., fatherhood status, being the main breadwinner or sole provider for [...] [Read more.](#)

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Conceptualization, Development and Psychometric Evaluations of a New Medication-Related Health Literacy Instrument: The Chinese Medication Literacy Measurement ([/1660-4601/17/19/6951](#))

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Abstract There is a need for valid and reliable instruments to focus on medication aspects of health literacy and help healthcare professionals address patients' barriers to medication use. This cross-sectional study describes the conceptualization, development, and psychometric properties of the first Chinese Medication Literacy [...]. [Read more.](#)

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[Rationing of Nursing Care in Intensive Care Units \(/1660-4601/17/19/6944\)](#)

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 Ewelina Kolarczyk (<https://sciprofiles.com/profile/986364>) and  Izabella Uchmanowicz (<https://sciprofiles.com/profile/1454033>)

Int. J. Environ. Res. Public Health **2020**, *17*(19), 6944; <https://doi.org/10.3390/ijerph17196944> (<https://doi.org/10.3390/ijerph17196944>) - 23 Sep 2020
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Abstract The nursing practice refers to a wide range of tasks and responsibilities. In a situation where there is a problem of limited resources, nurses are forced to ration the patient's care—that is, minimize and skip some tasks. The main purpose of this work [...]. [Read more.](#)

(This article belongs to the Special Issue [Evidence-Based Practice and Advanced Nursing Care](#) ([/journal/ijerph/special_issues/Evidence_Based_Care](#).)

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Article

Nutrition Education Intervention Increases Fish Consumption among School Children in Indonesia: Results from Behavioral Based Randomized Control Trial

Trias Mahmudiono ^{1,2,*} , Triska Susila Nindya ¹, Qonita Rachmah ¹ , Calista Segalita ¹  and Luh Ade Ari Wiradnyani ²

¹ Department of Nutrition, Faculty of Public Health, Universitas Airlangga, Jl. Mulyorejo Kampus C, Surabaya 60115, Indonesia; triska.nindya@fkm.unair.ac.id (T.S.N.); qonita.rachmah@fkm.unair.ac.id (Q.R.); calsglt@gmail.com (C.S.)

² Southeast Asian Ministers of Education Organization Regional Centre for Food and Nutrition (SEAMEO RECFON) Pusat Kajian Gizi Regional (PKGR), Universitas Indonesia, Jl. Salemba Raya No.6, Jakarta Pusat 10430, Indonesia; awiradnyani@seameo-recfon.org

* Correspondence: trias-m@fkm.unair.ac.id; Tel.: +62-31-5964808

Received: 22 August 2020; Accepted: 21 September 2020; Published: 23 September 2020



Abstract: This study aimed to analyze the effectiveness of behavioral-based nutrition education to increase fish consumption among school children using a raised bed pool. This was a randomized control trial study with a 3-months nutrition education intervention using a raised bed pool, as a medium to improve their internalization to increase fish consumption behavior. A paired *t*-test was used to calculate the difference in the increase of fish consumption, knowledge, attitude, perceived behavioral control, subjective norm, and intention. This study took place in a majority of low to medium urban households in Surabaya in Sidotopo Wetan I and Sidotopo Wetan II elementary school. Elementary school children at 4th and 5th grade and mother of elementary school children with 104 children were eligible and willing to participate. After the completion of interventions, significant improvement in delta-mean and effectiveness observed in attitude, subjective norm, perceived behavioral control, intention, knowledge, and fish consumption ($p < 0.001$). The 3 months of nutrition education intervention based on the theory of planned behavior significantly increase fish consumption among elementary school children. The increased consumption was believed to be related to the increase in children's knowledge and attitude towards consuming fish.

Keywords: nutrition education; fish consumption; school children; raised bed pool; Indonesia

1. Introduction

Hidden hunger, a micronutrient deficiency such as iron, iodine, vitamin A, or calcium, is one of the nutrition problems that still exist in a developing country, including Indonesia. The prevalence of anemia in schoolchildren globally reached 37% in which was found to be higher in Asian children than African [1]. Based on the Indonesia Family Life Survey (IFLS), the prevalence of anemia in children aged 5–12 years declined from 36.4% in 2000 to 20.6% in 2008 [2]. The latest report shows that the prevalence of anemia in children aged 5–14 years is 26.4% and count as a public health problem [3]. A study in one primary school in Surabaya found that the anemia prevalence in the schoolchild reached 13.2% [4].

In the short term, anemia in schoolchildren affects the level of learning concentration due to reduced oxygen supply to the brain causes a lack of hemoglobin [5]. In the long term, the condition

of anemia in children causes several health consequences, especially during childhood development. Anemia was more at risk for developing neurologic delays [6].

A study in Makassar found that schoolchildren who only occasionally (2–3 times/week) consume heme protein sources are more at risk of anemia than those who frequently (4–7 times/week) consume [7]. Protein sources affect the type of iron that can be absorbed by the body and could lead to anemia if absorption is low.

Fish is one source of heme protein that has a good iron absorption rate. Protein content in fish reaches 18% and consists of essential amino acids. According to the Indonesian Food Exchange List, one serving of fresh fish (50 g) contains 10 g of protein and 2 mg of iron. The Total Diet Study in 2014 reported the average consumption of fish and processed fish meat. The children group (aged 5–12 years) was 70.7 g per person per day [8]. East Java is one of the provinces with the highest growth of fish consumption per kg/capita/year since 2010–2014. Fish consumption in 2010 was only 19.01 kg/capita/year up to 27.89 kg/capita/year with a 46% growth level in the last 4 years. Fish consumption in East Java is predicted to continue to rise [9]. In 2019, fish consumption is targeted to reach 54.49 kg/capita/year [10].

Surabaya is included as the second largest metropolitan city in Indonesia, with approximately 2.8 million people [11]. With a large population, community health insurance based on Community Health Enterprises (SMEs) is perceived to be a practical option. Public health issues such as anemia require a comprehensive policy approach, although, in developing countries, resource limitations are often becoming a constraint [12]. However, given the magnitude of the impact of anemia on the quality of Indonesian human resources, efforts should be made to overcome the problem with the improvement of the intervention method. Nutrition education is one of the most cost-effective interventions and resulting in a long-lasting impact [13]. One of the behavior change theories that is widely used in nutrition education is the Theory of Planned Behavior (TPB) [14]. TPB addresses the potential for changes in participants' "desire," "intention," "attitudes," "perceived behavioral control," and "skills" for achieving the sought-after behavioral outcome of increased fish consumption as drawn by Figure 1.

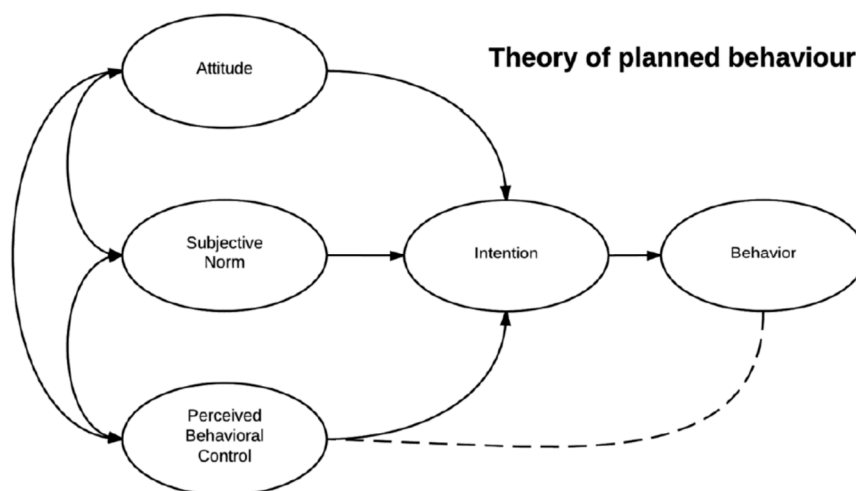


Figure 1. The Construct of Theory of Planned Behavior (adapted from [14] by Robert Orzanna).

The intervention of youth garden program based on the Theory of Planned Behavior succeeded in improving the attitude of the children related to the increase of vegetables and fruits consumption both in boys ($B = 1.525$; p -value < 0.001) and girls ($B = 1.421$; p -value < 0.001), as well as increased of perceived behavior control in consuming vegetables and fruits in girls ($B = 0.303$; p -value = 0.014) [15]. Nutrition education interventions based on school gardens are widely used and succeeded in increasing the desire and intention to try eating vegetables and fruits in children, children's knowledge of the importance of eating vegetables and fruits, as well as improving children's attitudes and skills to

increase vegetable and fruit consumption [16,17]. Another study also mentioned that school-based gardens are useful because of their experiential and direct learning in schoolchildren [18].

Analogous to involving children in school garden activities to increase consumption of fruits and vegetables, increased consumption of fish may be triggered by involving children in fish farming activities in the school pool (raised bed pool). Raised Bed Pool (RBP) can be made using simple materials such as tarpaulins and wood/bamboo buffers that are filled with water for aquaculture, so they do not have to dig the soil. During this time, RBP has been implemented in several regions in Indonesia through the NICE program in six provinces in Indonesia namely North Sumatra, South Sumatra, West Nusa Tenggara, East Nusa Tenggara, West Kalimantan, and South Sulawesi. However, the use of RBP is limited only as a source of animal protein and the potential to be used as nutrition education media is still not widely recognized. By using RBP media in nutrition education as an instant reminder for schoolchildren is expected to increase school children's intention to eat fish. The RBP Project also targets variables to increase school children's perceived behavior control to eat fish with a weekly fishmeal program, fish-game cards, and catfish-based food menu making. Besides, RBP will also conduct a "Catfish Hours" program where school children are asked to help provide food for catfish raised in the RBP program.

Likely, a nutritional education intervention program with RBP to improve the achievement of the central government program "Love Eating Fish" and the prevention of anemia in school children can follow the success of the school gardening program. School gardening and raised bed pool equally prioritize the concept of mastery experience for children to be actively involved in the management of gardening programs or cultivating freshwater fish. Compared to the raised bed garden, the raised bed pool program produces an animal food source of heme-iron protein that is relatively easily absorbed by the body than non-heme iron. School children's characteristics are more interested in interacting with moving objects rather than stationary objects. Together with RBP, providing nutrition education to improve school children's knowledge of the importance of eating fish for growth and prevention of anemia, then school children involved in the RBP program will be able to associate new knowledge information with their activities while taking care the RBP. Based on the description above, this research would like to evaluate the effectiveness of RBP as a medium of nutrition education intervention to increase fish consumption as part of anemia prevention efforts in school children. Our hypothesis that behavioral-based nutrition education using a "raised bed pool" could improve fish consumption of school children.

2. Materials and Methods

2.1. Study Setting and Sample

The study was conducted at Sidotopo Wetan I and Sidotopo Wetan II elementary school, Sidotopo Sub-district, Surabaya, Indonesia. Sidotopo is a region in Surabaya, with the majority of the people, are having low to medium monthly income. This district is included as one of the slum districts in North Surabaya. According to Surabaya Regional Statistical Survey [11], Sidotopo had a higher migration rate compared to other subdistricts. Hence, with a narrow space to live and overloaded with migrants, the slum environment could not be hindered. Inclusion criteria for the study were school children aged 10–12 years, not allergic to fish, and not on a special diet due to health problems (i.e., type 1 diabetes diet, low protein diet, weight loss diet).

Meanwhile, the withdrawn criteria were for the subjects missing >50%, or more than 3, intervention sessions. The school was chosen purposively by considering the location of the Sidotopo Subdistrict has the majority of residence categorized in the low and middle income where protein (including fish) availability and consumption tends to be low. The selection of Sidotopo Wetan I and II elementary school was based on easy accessibility, there was no raised bed pool, and there was no similar research before. Research subjects were elementary school children at 4th and 5th grade and mother of elementary school children. Based on a preliminary survey conducted in both elementary schools, the total

number of grade 4 and 5 students recorded were 900 children (research population). A screening then performed based on the inclusion criteria and 800 eligible subjects were retrieved. The sample size in this study was determined using a formula of sample size for comparing the mean of continuous measurement in two samples. Using a z-statistic to approximate the t-statistic with the effect size calculated from the results of McAleese et al. [19] on increased consumption of vegetables per serving in nutritional education interventions based on school gardening ($n = 45$, $SD = 1.7$, $ES = 1.2$) compared with the control group. By using 80% power and alpha of 0.05, the minimum samples obtained without cluster correction were 32 subjects for each group. Then, taking into account the design effect $1 + (\rho(m + 1))$ using cluster size 30 and Inter-cluster Correlation Coefficient (ICC) = 0.043 based on manual diabetic research [20]. The design effect formula accounted for m number of observations in each cluster and ρ (rho) is the intra-cluster correlation. The minimum sample required was 46 primary school children in each group with the consideration of 10% drop out, the sample in this study was 52 school children in each group. The total sample in this study was 104 school-age children aged between 10–12 years taken from eligible and willing participants. Matching was done to reduce the influence of bias due to education level and gender. Randomization of the sample study was performed using computer software to generate random numbers. The adapted CONSORT diagram in Figure 2 showed the sampling procedure of the study.

The independent variables in the study were the nutrition education intervention (utilizing RBP) and the control condition where children and mothers were given printed materials. The nutrition education intervention would be expected to influence the key outcome (dependent variable) of fish consumption by altering mediating variables (from the TPB), resulting in actual behavior change in the form of consumption of fish. The moderating variables in this study including characteristics of school children, socio-economic status (SES) of the schoolchild's family, knowledge; mediating variables include attitudes, intentions, subjective norms, and perceived behavior control of school children to eat fish, while the behavioral outcome was fish consumption. Nutrition education would hypothetically result in more reported fish consumption than the use of printed materials alone. Fish consumption was measured using a food diary record in which students were trained to fill the record form before the baseline data were taken. A total of three-days food diary records on all food consumed were collected in a week based on the previous study mentioned that 3-day food records made the best agreement compared to another dietary assessment [19]. Before administered food, research assistants were trained to filling the food record form. After data collection, they also do the data recheck and input to the software. Dietary data were analyzed using food processor software *Nutrisurvey*; drawing from a database of Indonesian Food updated yearly by the Department of Nutrition, Universitas Airlangga, Indonesia.

2.2. Ethics

Ethics approval for this study was received from the Institutional Review Board (IRB) at the Faculty of Public Health Universitas Airlangga approved the trial (reference number: 159-KEPK) dated 26 April 2017. The ethics obtained were aligned with the Helsinki protocol ensuring animal welfare throughout the study. Align with the beneficence principle, the use of catfish in the study was beneficial towards acquiring new knowledge and evidence. Furthermore, the fish was commonly eaten in the site of the study hence benefitting the nutrient intake of the children. The Universal Trial Number (UTN) for this study is U1111-1199-992. This trial was registered in the Thai Clinical Trials Registry (TCTR) and was allocated trial registration number TCTR20171207002. This research project had been approved for registration at TCTR since 2017-12-04 12:01:33. Before the study began, the mother's or child guardian was first called by the teachers to the parent's gathering at school. The research leader then explaining the study details to the prospective subjects about the child's enrollment. During recruitment, potential participants and their mothers were given verbal and written information about the study, and at least one week to think about participating. Verbal and written informed consent was

obtained during the monthly community health post-meeting. Participants are free to withdraw from the study at any time without negative consequences.

2.3. Anthropometric Measurement

The child's weight was measured using the Omron HBP-317 digital scale with a 0.01 kg correction and measured in light clothing without shoes. Height was measured to the nearest 0.1 cm using a stadiometer (SECA 213). Both weight and height were measured twice to ensure the result's validity. The third measurement will be taken if the difference between two prior two measurements differs by more than 1%. Another measurement to assess the nutritional status of the children was body composition, including body fat and body muscle percentage, as well as the resting metabolic rate. These indicators were measured using Omron HBF-317 that validated with the SECA digital weight scale. Bodyweight and composition data were collected to understand the distribution of school children's nutritional status, but it is not in terms of the impact of fish consumption. Rather, the assessment is to describe the school children by their nutritional status which is indicated by their growth indicators.

2.4. Characteristics and Nutrition Knowledge

A general questionnaire was developed to obtain parent's social-economic status (SES) data that includes parent's educational background, employment, and the number of a family member, literacy level, family income, and food expenses. A child's nutritional knowledge was measured using a questionnaire that was previously validated [16]. The questionnaire consists of three parts; the first part focus on the nutrition and health knowledge with a total of six questions and the second part focuses on household serving size to measure how well children know about the portion, and the last part consists of questions related to MyPlate Indonesia. The household serving size questionnaire consists of six questions, while MyPlate Indonesia consists of an essay question in which children were asked to categorize several food items to their group.

2.5. Theory of Planned Behavior

Outcome related psychological data obtained in this study, including children's attitude, subjective norm, perceived behavioral control, behavior, and intention toward fish consumption. All of the psychological data questionnaires were developed as Likert scale answers based on Bandura's guide for constructing attitude, subjective norm, perceived behavioral control, behavior, and intention scales [20]. Children's attitude to consuming fish as the source of animal protein was measured using a three-item questionnaire (e.g., attitude toward increasing food consumption, attitude towards consuming fish at least twice a week, and attitude toward consuming fish every day). Similar to attitude measurement, three other indices including perceived behavioral control (e.g., consuming food is easy, willingness to consume fish, and willingness to consume fish if they know the possible danger of not consuming fish). Intention to consume fish was also measured using three questions (e.g., intention to consume fish, trying to consume fish, and planning to consume fish). Additionally, subjective norms towards fish consumption measured using 6 indicators in eight questions, including behavioral belief strength, outcome evaluation, injunctive normative belief strength, motivation to compliance, descriptive normative belief.

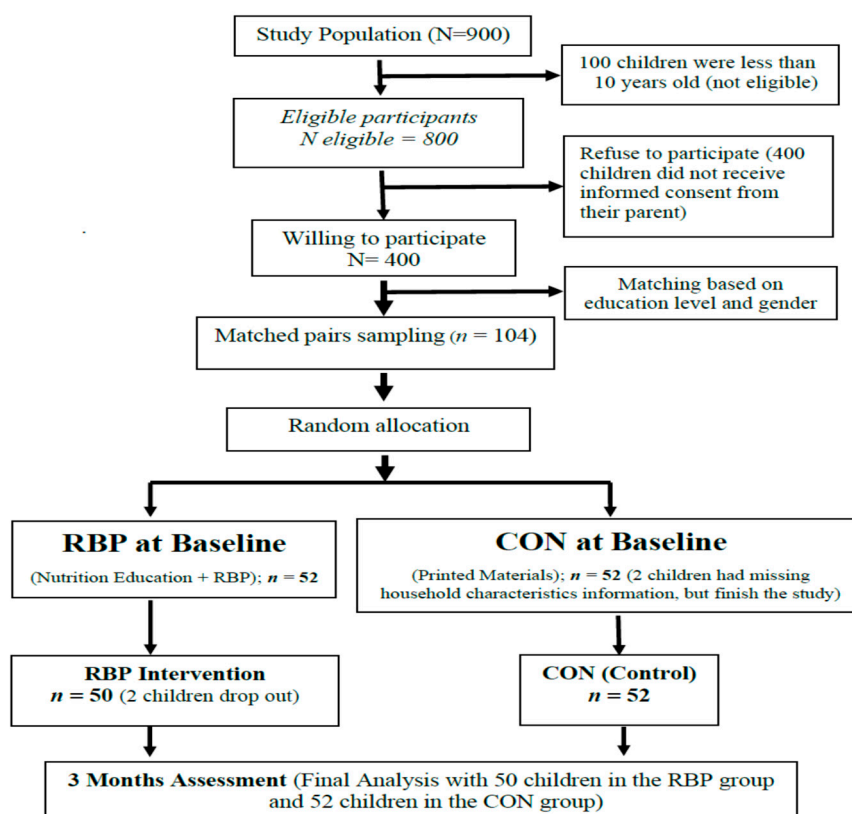


Figure 2. The CONSORT diagram of the study.

2.6. Intervention

This was a randomized control trial (RCT) with intervention in the form of nutrition education for 3 months targeting school children. All school children in this study received nutrition education material (booklet) describing strategies to increase fish consumption according to the Theory of Planned Behavior (TPB) constructions. Following random allocation, children were then divided into 2 groups; control group (CON) and intervention group (RBP). The control group (CON) did not receive nutrition education or fish pool in their school environment but received sets of printed educational materials, including infographics, comics, and recipe books. We did not further contact with the CON participants following the delivery of printed materials. The intervention group (RBP) got 6 nutrition education sessions focusing on recommendations for fish favors, fish pond maintenance, and bento making practices with fish dishes, and eating fish together in school. The comic describes the benefit of catfish in increasing student's concentration during school hours. Besides, the infographic described anemia risk factors, strategies to improve anemia condition, and nutritional values of fish. Fish that acquired in one RBP pool was farmed catfish as much as 5000 seeds in one raised bed pool of 2×3 m. The pool was build in the schoolyard provided with a rooftop for shade. At the end of the study, some of the fish were harvested and some were continued to be raised by school guards/personnel.

Moreover, stationeries provided each participant after consenting to involve the whole study; the same goes for the control group. Six education sessions for the RBP group will be given once every two weeks for three months. Each education season approximately takes 30–90 min depending on the kind of activity given which consist of the class session, interactive games, and making a goal setting. During the nutrition education sessions, hands-on activities were provided to help children improve their self-efficacy toward fish consumption.

The nutrition education sessions were administered by three investigators in Indonesia with expertise in community nutrition from Nutrition Department, Public Health Faculty Universitas Airlangga, two investigators, hold a master's degree in nutrition and one investigator holds a doctoral

degree in nutrition. Six trained research assistants who each hold a bachelor's degree in public health nutrition delivered a hands-on activity session.

2.7. Statistical Analyses

A paired *t*-test was used to analyze the difference in outcomes of control and intervention groups. This statistical analysis has been adjusted for possible confounders such as school children characteristics, SES, and household characteristics. All data analyses were performed at IBM SPSS Statistics 22.

3. Results

At the beginning of the study, the total number of participants was 104 consisting of 52 children aged 9–12 years in each intervention and comparison group. However, two children in the intervention group were dropped as a result of not completing all of the six educational sessions. The drop-out rate from the intervention group was 3.8%. Thus, the analyzed result of the rest of the 102 samples was able to illustrate the effectiveness of nutrition education intervention using a raised bed pool. According to the data in Table 1, the average primary school children age in this study was 11.5 and their average height was around 145 cm. The average weight of the control group was slightly higher (43.76 kg) compared to the intervention group (39.6 kg). However, based on the *t*-test independent analytical test, it was found that between the control and intervention group there was no significant difference in children's characteristics in terms of age, height, total fat, and resting metabolic.

Table 1. Children characteristics.

Children Characteristics	Control Group (<i>n</i> = 52)		Intervention Group (<i>n</i> = 50)		<i>p</i> -Value
	Mean	SD	Mean	SD	
Age, years	11.56	0.61	11.76	0.66	0.109
Height, cm	145.04	7.16	144.43	7.07	0.665
Weight, kg	43.76	13.88	39.60	12.07	0.111
BMI, kg/m ²	20.48	5.14	18.99	4.29	0.118
Total Fat, g	26.52	22.96	23.26	5.99	0.333
Resting Metabolic Rate, Cal/day ^a	1111.09	309.50	1001.48	260.20	0.056
Fish consumption at Baseline	0.37	0.66	1.30	1.02	<0.001 *

* Statistically significant at alpha = 0.05 based on the independent *t*-test; ^a RMR was retrieved through BIA body composition tools.

Unfortunately, 2 children in the control group were not completing the household characteristics but they were able to complete the study hence considered missing data. Hence we included in the final analysis of the study, even though as seen in Table 2, only 50 children in each group were presented for their household characteristics. As can be seen in Table 2, most of the respondent families were the nuclear family (80%), literate mother (92%), and senior high school graduates (46%). Most of the respondent mothers were housewives (85%) and also most of the respondent fathers were senior high school graduates (85%). Most of the family income was between IDR 500,000.00 to IDR 2,000,000.00. The average family income and outcome in the intervention group were slightly higher compared to the control group. However, there was no meaningful difference based on the Chi-Square result (*p*-value = 0.054). Compared to the minimum wage for the Surabaya district (IDR 3,296,212.50), most of the family income in our study was much lower [11].

Table 2. Household characteristics.

Household Characteristics	Control Group (n = 50)		Intervention Group (n = 50)		p-Value *
	n	%	n	%	
Type of household					
Nuclear family	41	41	39	39	0.617
Extended family	9	9	11	11	
Maternal literacy					
Partially Literate	2	2	6	6	0.140
Literate	48	48	44	44	
Mother's education					
Did not Finish Elementary	1	1	1	1	0.212
Finish Elementary	11	11	4	4	
Finish Junior High School	2	2	8	8	
Finis Senior High School	27	27	28	28	
Diploma	4	4	3	3	
University	5	5	6	6	
Mother's occupation					
Housewife	42	42	43	43	0.437
Civil Servant	0	0	1	1	
Company Worker/Employee	1	1	0	0	
Farmers/Labour	0	0	1	1	
Service Worker	7	7	4	4	
Others	0	0	1	1	
Household income (IDR)					
<500,000	2	2	5	5	0.054
500,000–1,000,000	13	13	2	2	
>1,000,000–1,500,000	5	5	4	4	
>1,500,000–2,000,000	9	9	16	16	
>2,000,000–2,500,000	3	3	5	5	
>2,500,000–3,000,000	7	7	9	9	
>3,000,000	11	11	9	9	
Household food expenditure					
<500,000	2	2	5	5	0.243
500,000–1,000,000	16	16	2	2	
>1,000,000–1,500,000		5	4	4	
>1,500,000–2,000,000	8	8	16	16	
>2,000,000–2,500,000	3	3	5	5	
>2,500,000–3,000,000	6	6	9	9	
>3,000,000	10	10	9	9	

* The difference in characteristics was analyzed using the Chi-Square test.

After nutrition education was given for 3 months consisted of 6 sessions education, it was shown that there was a significant improvement in children's attitude towards fish consumption score. As can be seen in Table 3, significantly changed children's attitude toward fish consumption was found in the intervention group. The behavior itself was categorized into some categories such as children's attitude towards fish consumption minimum twice a week was fun (p -value < 0.001), everyday fish consumption was beneficial for health (p -value = 0.001), fun (p -value = 0.003), and considered as a good habit (p -value = 0.001).

Table 3. Change in children’s attitude towards fish consumption after 3 months of intervention.

Attitude Score	Control Group (n = 52)			Intervention Group (n = 50)		
	Delta Mean	SD	p-Value	Delta Mean	SD	p-Value
Benefit of fish consumption for health	−0.54	1.91	0.048*	0.26	1.35	0.180
Enjoyment on consuming fish for health	−0.58	2.39	0.087	−0.04	2.09	0.893
Good or bad if we ate fish for our health	−0.25	1.91	0.352	−0.20	2.73	0.607
Benefit of fish consumption for health twice a week	0.19	2.52	0.585	0.40	1.81	0.124
Enjoyment on consuming fish for health twice a week	0.31	2.53	0.385	1.38	2.16	<0.001 *
Good or bad if we ate fish for our health twice a week	0.59	2.38	0.077	0.37	2.79	0.362
Benefit of fish consumption for health everyday	0.46	2.53	0.195	1.22	2.54	0.001 *
Enjoyment on consuming fish for health everyday	1.08	4.84	0.115	0.90	2.05	0.003 *
Good or bad if we ate fish for our health everyday	0.52	2.46	0.134	1.44	2.99	0.001 *

* Statistically significant at alpha = 0.05 based on the paired *t*-test.

Table 4 showed the diverse average score of children’s subjective norm associated with fish consumption suggestion. Some of the children’s subjective norm in the control group decreased (delta mean negative) compared to the intervention group who had an increasing tendency (delta mean positive). However, the *t*-test paired result showed no significant result in increasing and decreasing the average score of children’s subjective norm in fish consumption in the control and intervention group.

Table 4. Change in children’s subjective norm in fish consumption after 3 months of intervention.

Subjective Norm Score	Control Group (n = 52)			Intervention Group (n = 50)		
	Delta Mean	SD	p-Value	Delta Mean	SD	p-Value
Parental advice to eat fish	−0.23	1.42	0.248	0.16	1.66	0.498
Peers/friends advice to eat fish	−0.27	1.74	0.269	0.44	1.87	0.138
Teacher advice to eat fish	−0.31	1.59	0.169	−0.14	1.47	0.504
Doctor advice to eat fish	−0.33	1.59	0.145	−0.22	1.46	0.292
Parental consent to eat more fish	−0.35	1.44	0.089	−0.10	1.50	0.640
Peers/friends consent to eat more fish	0.31	2.21	0.320	0.32	1.65	0.176
Teacher consent to eat more fish	−0.12	1.35	0.541	0.06	1.47	0.775
Doctor consent to eat more fish	−0.17	1.74	0.475	−0.14	1.54	0.523

Statistically significant at alpha = 0.05 based on the paired *t*-test.

Table 5 showed the diverse average score of children perceived behavioral control associated with fish consumption suggestion. Some of the children’s perceived behavior control indicators in the control group decreased (delta mean negative) compared to the intervention group who had increasing perceived behavior control (delta mean positive). Nonetheless, the *t*-test paired test did not show a significant difference in increasing and decreasing the average score of children perceived behavioral control in fish consumption in the control and intervention group.

Table 5. Change in children’s perceived behavioral control towards fish consumption after 3 months of intervention.

Perceived Behavioural Control Score	Control Group (<i>n</i> = 52)			Intervention Group (<i>n</i> = 50)		
	Delta Mean	SD	<i>p</i> -Value	Delta Mean	SD	<i>p</i> -Value
Perception that increasing fish consumption in one month is easy	−0.12	1.75	0.636	−0.36	2.14	0.239
I can increase my fish consumption if I wanted to	−0.02	2.65	0.958	0.32	1.96	0.255
I can increase my fish consumption if I know the benefit for it	−0.52	1.85	0.049 *	0.18	1.54	0.411

* Statistically significant at alpha = 0.05 based on the paired *t*-test.

As can be seen in Table 6, the result of nutrition education using a raised bed pool in this study did not contribute to a significant change for children’s intention to consume fish.

Table 6. Change in children’s intention towards fish consumption after 3 months of intervention.

Intention Score	Control Group (<i>n</i> = 52)			Intervention Group (<i>n</i> = 50)		
	Delta Mean	SD	<i>p</i> -Value	Delta Mean	SD	<i>p</i> -Value
I intent to eat fish	−0.15	1.76	0.532	0.02	1.57	0.929
I will try to eat fish	−0.25	2.02	0.376	−0.30	1.74	0.229
I am planning to eat fish	−0.54	1.93	0.049 *	−0.28	1.85	0.290

* Statistically significant at alpha = 0.05 based on the paired *t*-test.

Children’s intention to consume fish increased in the intervention group with raised bed pool (Δ mean = 0.02) meanwhile, in the control group the intention score decreased compared when it was in baseline and end-line study (Δ mean = 0.15).

One of the important discoveries in this study was that there was a significant improvement in the number of fish consumed by students in the intervention group (*p*-value = 0.022) after 6 education sessions and the use of a raised bed pool. Meanwhile, in the control group, there was no difference in the number of fish consumed in a day after three months of the study had been done (*p*-value = 0.184). In the intervention group, the number of fish consumption in a day was too small therefore the increasing number of fish consumption was not illustrated in increasing energy intake (*p*-value = 0.054), protein (*p*-value = 0.083), and fat (*p*-value = 0.151). In Table 7, in the control group, increasing fish consumption did not associate with increasing of energy (*p*-value = 0.051), protein (*p*-value = 0.082), and fat (*p*-value = 0.052).

Table 7. Change in children’s fish consumption after 3 months intervention.

Variable	Control Group (<i>n</i> = 52)			Intervention Group (<i>n</i> = 50)		
	Delta Mean	SD	<i>p</i> -Value	Delta Mean	SD	<i>p</i> -Value
Number of fishes consumed	0.19	1.03	0.184	0.58	1.74	0.022 *
Energy intake from fish consumed (kcal/day)	11.73	42.42	0.051	21.87	78.33	0.054
Protein intake from fish consumed in a day (gr/day)	1.95	7.90	0.082	3.38	13.49	0.083
Fat intake from fish consumed in a day (gr/day)	0.38	1.37	0.052	0.84	4.07	0.151

* Statistically significant at alpha = 0.05 based on the paired *t*-test.

Table 8 showed that there was a significant improvement in children’s knowledge related to the benefit of fish consumption in the intervention group with 6 session nutrition education for three months and used raised bed pool media (*p*-value < 0.001). However, the control group with only

printed educational material also showed a significant increase in knowledge related to the importance of fish consumption (p -value = 0.001).

Table 8. Change in children’s knowledge of the importance of fish consumption after 3 months of intervention.

Variable	Control Group ($n = 52$)			Intervention Group ($n = 50$)		
	Delta Mean	SD	p -Value	Delta Mean	SD	p -Value
Knowledge Score	1.29	2.65	0.001 *	1.70	2.54	<0.001 *

* Statistically significant at alpha = 0.05 based on the paired t -test.

4. Discussion

In this study, respondents were specifically learned more about fish consumption, including their benefits, how to prepare them, and how they taste, which may help to facilitate and increase their fish consumption. It is known that schoolchildren need a good diet to develop and grow well. Theory of Planned Behavior (TPB) based intervention using Raised Bed Pool (RBP) in this study revealed that nutrition education within 3-months had given significant effect on students’ behavior which consist of attitude, subjective norm, perceived behavioral control, knowledge, and the amount towards fish consumption. This approach was proven in the previous study that after intensive 3-months nutrition education through the workshop, utilization video, and photovoice has significantly increased fish consumption by more than 5 g per day [21].

Ajzen posited that the change in healthy eating behavior would be easier to be adopted if it is done at the earliest stage of life [22]. Childhood has been identified as a critical period for the development of eating patterns that track to adulthood [23–25]. Considering the importance of good nutrition in childhood to achieve healthy growth and development. It will be essential to give children the opportunities to be exposed to healthy food as early as possible [26,27]. A systematic review of related factors influencing children’s eating behavior explained that children’s eating pattern was influenced by the food environment provided by parents and children’s experience [25]. Furthermore, the healthy eating behavior of the children was mirrored by the parent’s eating behavior. One of the healthy eating pattern practices that still needs to be improved in children is fish consumption habits. The latest data from the national survey in 2014 showed that consumption of fish and its product in children was only 70.7 g, lower compared to adult and elderly groups [8], while the availability of fish in Indonesia is quite high. Fish is one of the recommended types of protein consumed by children because of the good fat content that is beneficial for brain development and also high iron content that can reduce the risk of anemia in children.

Our study revealed that the usage of a raised bed pool as a medium for nutrition education intervention successfully improves students’ fish consumption. This highlighted that TPB-nutrition education added by the raised bed pool as an effective nutrition media enhances behavioral change (knowledge, attitude, perceived behavioral control, and intention) related to fish consumption. TPB nutrition education is still necessary as the main effort to convey messages on the importance of consuming fish to school children. Meanwhile, access to RBP adds to hands-on or experiential learning for students. This study added to the growing evidence that school-based nutrition education (NE) programs could lead to moderate increases in fish consumption among children [19,28,29]. Based on the Theory of Planned Behavior construct, the behavior is strongly influenced by intention, which together is influenced by attitudes, subjective norms, and perceived behavioral control [15]. All of the nutrition education activity carried out in this study directed at modifying determinants of behavior (attitudes, subjective norms, perceived behavioral control, and intention of consumption), and consumption of fish. Our study was aligned with a randomized control trial based on TBP construct in 86 children by using 14 sessions of 60 min nutrition education was successfully increase children’s fruit and vegetable intake by first increasing their attitudes, subjective norms, and perceived behavioral control [30].

Furthermore, Kim and Park [29] also explained in their study that garden-based integrated with social cognitive theory elements as one of the behavioral change strategies successfully improved children's eating behavior for vegetables; which strengthen our results that both TPB and RBP intervention were needed to improve children's behavior towards fish consumption.

The raised bed pool is adapted from a raised bed garden (RBG). While RBG is the utilization of the garden, RBP is the utilization of the pool. Studies have shown that RBG can significantly increase fresh fruit and vegetable consumption; therefore, RBP is expected to be able to increase fish consumption [28]. In addition, RBP can be a powerful learning medium that is beneficial and worthwhile for both teachers and students. RBP is unique media as it provides potential protein sources from the fish in the pool that is lacking from RBG. Similar to RBG, RBP provides an atmosphere that incorporates hands-on activities and strengthens academic, personal, and social skills. Moreover, it allows children to develop and strengthen their life skills in areas such as nutrition, leadership, and decision making [19].

RBP is a medium that provides authentic and hands-on experience to nature, which is effective at increasing cognitive abilities and higher-order thinking skills. The term "hands-on" gives a more concrete definition of hands-on instruction as well as its influences which young students especially learn through actions, more so than older students, and therefore experience greater benefits from hands-on and action-oriented learning [31]. This helps more students experience more success in their learning because multiple senses reinforce it at once. A meta-analysis study in students in Australia showed that experimental nutritional learning at school was associated with higher effects in healthy consumption in students [30]. It is also supported by the previous study that school garden-enhanced nutrition education could increase students' willingness to taste vegetables and their vegetable taste ratings [32]. It is further explained that the school garden may increase vegetable intake, but other determinants might take part.

Based on Piaget and other scientists' theories, they stated that a child's understanding is developed through his actions on the environment not merely through language [33]. As stated before, experiential education techniques (e.g., raised bed pool) helps children to develop cognitive skills. It will increase children's intrinsic motivation to learn. It can be said that using RBP is an effective learning technique due to their hands-on experience, not to mention with the 3 months. The raised bed pool will be served as a visual reminder to the children that actual learning will magnify the effect of the 6 sessions of behaviorally oriented nutrition education.

One of the strengths of the study is that evidence on the effectiveness of nutrition education intervention using a raised bed pool was scarce relative to the abundance body of knowledge related to the raised bed garden. However, little work has been carried out to address the effectivity of raised bed pool as a nutrition education media and previous work have not comprehensively considered. A limitation in this study is the fact that variation and inequalities between elementary schools whether it was a private or public school. Both elementary schools involved in this study were drawn from public schools located in the low to middle-income population. Generalization of the results of the intervention could be limited due to the current setting of the sample. To limit potential bias, all measurements were performed through a standardized protocol, and all enumerators were trained before data collection. As the study did not measure the actual amount of fish served to the children by their parents, richer parents within the intervention group could induce a bias. Richer parents (intervention group) could afford to buy fish more often, while poorer parents (control group) would be limited. Another limitation was the absence of iron level or anemia status and total energy intake measurement due to budget limitation. Thus, future research might mention this as other dependent variables.

For further studies, another innovative form of nutrition education is needed. Given the complexity of dietary behavior change, a comprehensive study to understand several factors that might affect children's behavior in consuming fish need to be explored. The education material should be consisting of the number of fishes that should be consumed based on children's (9–11 years) Recommended Dietary Intake (RDI).

5. Conclusions

In conclusion, the 3 months nutrition education intervention based on the theory of planned behavior significantly increase fish consumption among elementary school children. The increased consumption was believed to be related to the increase in children's knowledge and attitude towards consuming fish. It is suggested to the school setting to continue the nutrition education effort by integrating raised bed pool media with the existing school health program.

Author Contributions: Conceptualization, T.M.; methodology, T.M., Q.R. and L.A.A.W.; software, L.A.A.W.; validation, T.M.; formal analysis, T.M., T.S.N. and C.S.; investigation, T.M., C.S. and T.S.N.; resources, T.M.; data curation, T.M., Q.R. and C.S.; writing—original draft preparation, T.M.; writing—review and editing, T.M., T.S.N., Q.R., C.S. and L.A.A.W.; visualization, C.S.; supervision, T.M., T.S.N. and L.A.A.W.; project administration, Q.R.; funding acquisition, T.M. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by The Ministry of Education and Culture of the Republic of Indonesia through contractual research between Universitas Airlangga and the South East Asian Ministers of Education Organization Regional Centre for Food and Nutrition (SEAMEO RECFON) Pusat Kajian Gizi Regional (PKGR), Universitas Indonesia. SEAMEO RECFON funded the open access publication of this article and Universitas Airlangga supported for proofreading and similarity check of this article. Furthermore, the funders had no role in the design of the study; collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

Acknowledgments: The authors would like to acknowledge the participants especially students, teachers, and parents on the study site in Sidotopo Wetan I and II elementary schools, Surabaya, East Java, Indonesia for their time and commitment to the study.

Conflicts of Interest: The authors declare no conflict of interest.

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