ZDRAVJE DELOVNO AKTIVNE POPULACIJE

HEALTH OF THE WORKING-AGE POPULATION

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health of the working-age population

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»Podaljševanje delovne aktivnosti in zmanjševanje odsotnosti z dela v KRZS – STAR-VITAL:
Združeni ukrepi za vitalnost starejših delavcev«

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Projekt »Podaljševanje delovne aktivnosti in zmanjševanje odsotnosti z dela v KRZS – STAR-VITAL: Združeni ukrepi za vitalnost starejših delavcev«. Naložbo financirata Evropska unija, in sicer iz Evropskega socialnega sklada ter Republika Slovenija, in sicer Ministrstvo za delo, družino, socialne zadeve in enake možnosti. Naložba se izvaja v okviru Operativnega programa za izvajanje Evropske kohezijske politike v obdobju 2014 – 2020, v okviru 8. prednostne osi: »Spodbujanje zaposlovanja in transnacionalna mobilnost delovne sile«, 8.3. prednostne naložbe: »Aktivno in zdravo staranje«, 8.3.1. specifičnega cilja »Podaljševanje in izboljšanje delovne aktivnosti starejših, vključenih v ukrepe«.

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Zdravje delovno aktivne populacije

H*ealth of the Working-Age population*

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Contents

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Relationship between physical activity and work efficiency among kindergarten employees

Anja Andrenšek[1], Matej Plevnik[2]

[1] Community Health Centre Brežice, Centre for Health Enhancement, Cesta bratov Milavcev 18, 8250 Brežice, Slovenia

[2] University of Primorska, Faculty of Health Sciences, Polje 42, 6310 Izola, Slovenia

anja.andrensek@gmail.com; matej.plevnik@fvz.upr.si

Abstract

Introduction: People who live a healthy lifestyle are less likely to develop chronic diseases, such as type 2 diabetes, obesity, hypertension and also osteoporosis, cancer, increased level of cholesterol, depression, anxiety, etc. The purpose of our study was to examine the correlation between physical activity and work efficiency among different job positions in kindergarten. *Methods:* The Global Physical Activity Questionnaire and the Work Ability Index Questionnaire were used to assess the intensity and the quantity of PA and an individual's work efficiency. *Resuts:* The comparison between the groups shows that the highest physical activity at work is assessed by the employees in support services, this group also best evaluates their ability to work, 54% describe it as excellent. The amount of physical activity is statistically significantly related to the work efficiency index only in the group of teacher assistants. *Discussion and conclusions:* The promotion of health protection at the workplace must be adapted to the needs of each group of employees in kindergartens. It is also recommended to encourage regular physical activity of all groups of employees.

Keywords: kindergarten, physical activity, work ability, workload, health enhancement

Introduction

Regular physical activity has a proven positive effect on physical and mental health and it also has an impact on the improved work efficiency and the overall quality of life. Reducing sedentary behaviour and maintaining regular physical activity, even if it does not meet the recommendations for the amount of physical activity, affects health, has a positive effect on preventing premature death and reducing the chances of various health risks. Regular physical activ-

ity, regardless of age, gender, chronic diseases and limitations present, reduces the incidence of cardiovascular disease, stroke, cancer, type 2 diabetes, obesity and osteoporosis (Warburton and Brendin, 2016).

Kindergarten brings together different groups of employees, who face different types of workload in their work: (i) kindergarten teachers, (ii) teacher assistants, (iii) administration and management of the kindergarten and (iv) employees in support services (cooks, cleaners, janitors). The most frequently studied groups of employees in kindergarten are teachers and teacher assistants. Kindergarten teachers/assistants perform a variety of work tasks that include teaching, supervision, hygiene maintenance tasks, as well as nutrition assistance. The workload is described from a metabolic point of view as low-intensity activity (Grant et al., 1995). Frequent incorrect postures and positions, fast work pace, insufficient amount of rest and lifting heavy loads increase the risk of musculoskeletal problems (Punnett and Wegman, 2004). In addition to physical exertion, teachers/assistants are also exposed to high levels of psychological stress. Teachers/assistants report overwork, time pressure and high responsibility; nevertheless, they find their work interesting (Čecho, Švihrová, Čecho, Novák and Hudečková, 2019). The purpose of our study was to determine the relationship between the level of physical activity and the work efficiency of kindergarten employees.

Methods

The study was conducted in September 2019 in cooperation with the Centre for Health Enhancement Piran and two kindergartens in the Municipality of Piran. It involved 73 kindergarten employees (teachers n = 24; assistants n = 27; administration n = 5; support services n = 17). To assess the intensity and quantity of PA and an individual's work efficiency, we used the Global Physical Activity Questionnaire (WHO, n. d.) and the Work Ability Index Questionnaire (European Agency for Safety and Health at Work, n. d.). The analysis of the results was performed in Microsoft Excel 2016 *(Microsoft Corporation, Redmond, Washington, USA*) and in SPSS (*SPSS statistics 26, IBM, New York, USA*), using methods of descriptive statistics and the analysis of correlations and differences. The statistical significance was set at $p < 0.05$.

Results

Recommendations on the amount of daily physical activity (WHO, 2011) are met by 95.2% of kindergarten teachers, 83.4% of assistants, 33.3% of employees in administration and 94.2% of employees in support services (Figure 1). The comparison between the groups shows that the highest physical activity at work is assessed by the employees in support services (Kruskal-Wallis H (3) = 16.667, p = 0.001).

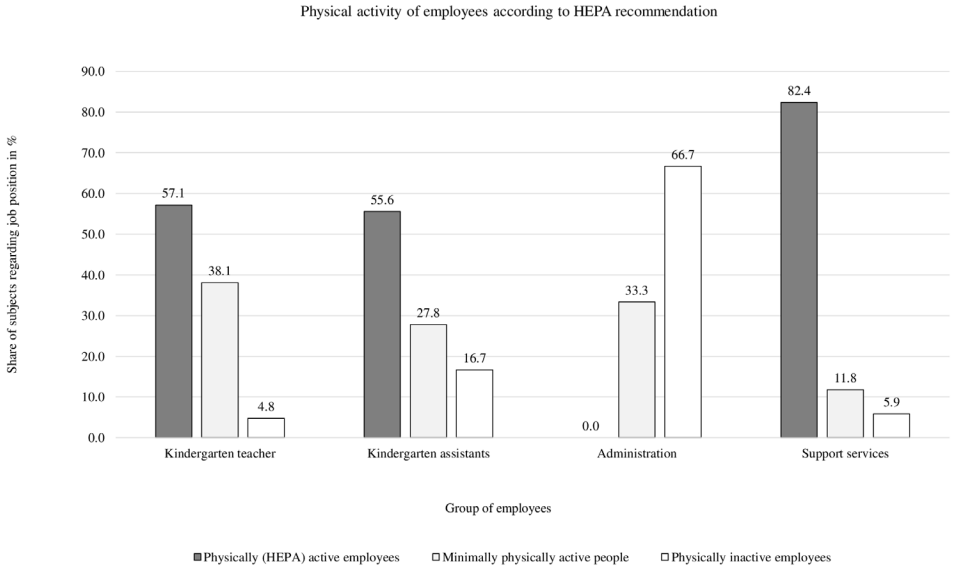

Figure 1: Physical activity of employees according to WHO recommendation (WHO, 2011) HEPA (Health enhancing physical activity) (WHO, 2020) recommendation

The group of employees in support services also best evaluates their ability to work; 54% describe it as excellent (Figure 2).

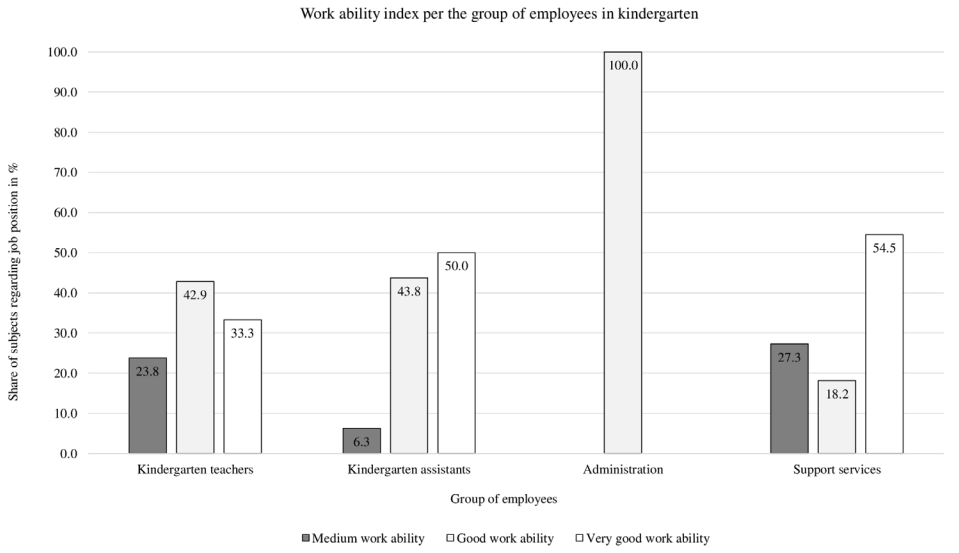

Figure 2: Work ability index per the group of employees in kindergarten

Very good work ability is assessed by 33.3% of kindergarten teachers, 50% of kindergarten assistants and 54.5% of employees in support services; howev-

er, the number of employees should also be taken into account. The amount of physical activity is statistically significantly related to the work efficiency index only in the group of teacher assistants ($\chi 2$ (2) = 8.878, p = 0.012).

Discussion

Research done in kindergarten is generally performed on kindergarten teachers and assistants regarding their health status (Wirth et al., 2016), voice health and risk factors for voice loss (Helidoni et al., 2012), mental health (Čecho et al. 2019), musculoskeletal disorders and the connection between musculoskeletal disorders and mental health (Ono et al., 2002; Pirbalouti et al., 2017) and regarding ergonomic adjustments of workplace (Burford et al., 2017). Our study revealed the level of physical activity and offered an insight into the working ability among different groups of employees in kindergarten. We noticed that only in the group of teacher assistants, the amount of physical activity was statistically significantly related to the work efficiency, though we expected to find correlations in all groups of employees. Regular physical activity maintains solid fitness, better mental health and maintains or improves work efficiency. However, regular physical activity is important also for the evaluation of competency for their work among kindergarten teachers/assistants. Physically active preschool teachers evaluate competencies for planning, organising, implementing and evaluating physical activities higher (Retar and Lepičnik-Vodopivec, 2017). Regular physical activity of kindergarten teachers/assistants is not only important regarding health and the overall quality of life but also as a factor of their perception of their own competencies for professional work.

Conclusions

Kindergarten brings together different groups of employees who face different types of workload in their work. In accordance with the daily workload, the promotion of health protection and enhancement at the workplace must be adapted to the needs of each group of employees. It is also recommended to encourage regular physical activity of all groups of employees in kindergarten.

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Dietary polyphenols and their effect on the gut microbiota and human health

Katja Bezek, Darja Barlič - Maganja

University of Primorska, Faculty of Health Sciences, Polje 42, 6300 Izola, Slovenia
katja.bezek@fvz.upr.si, darja.maganja@fvz.upr.si

Abstract

Problem presentation: Over the past decade the oxidative stress, caused by reactive oxygen species (ROS) has been recognized as a key factor in the development of various diseases e.g. diabetes, cardiovascular diseases and neurodegenerative disorders. Antioxidant support, which can also be provided with proper nutrition, can reduce the negative effects of oxidative stress and have a positive effect on our health. Plant foods are a rich source of biologically active compounds, among them many polyphenols are very important. Due to their well-known antioxidant properties, polyphenols are associated with a number of physiological mechanisms that have protective effects on various organs, including the gastrointestinal tract. Polyphenols and their metabolites help to maintain a healthy gut primarily through microbiota modulation. They have prebiotic-like effects, they can stimulate the growth of beneficial and inhibit the growth of pathogenic bacteria. In addition, the gut microbiota plays an important role in the metabolism of polyphenols, the production of active metabolites and their bioavailability. Therefore, the interaction between dietary polyphenols and gut microbiota can be of significant benefit to human health. *Purpose*: The aim of this review is to summarize the data on the protective role of dietary polyphenols and their metabolites on human health in general with an emphasis on gut microbiota modulation. *Conclusions*: Current research indicates that there is a positive relationship between dietary polyphenols and the healthy composition of the gut microbiota. Therefore, the promotion of a diet rich in plant foods should also be considered as an important element affecting the health of the working population.

Keywords: dietary polyphenols, gut microbiota, human health

Introduction

Dietary polyphenols represent a large class of naturally occurring chemical compounds characterized by the presence of multiple phenol structural units. As secondary metabolites, they are found widely in plant foods providing colour, flavour and astringency, and defence against exogenous stresses, like reactive oxygen species (ROS), ultraviolet radiation (UV) and plant pathogens. Due to the electron-donating phenolic groups polyphenols are well known antioxidants that prevent stress-related cellular and extracellular damage. In humans, they have been found to possess important biological activities, including anti-inflammatory, anticarcinogenic and antimicrobial activities (Zhang, 2015). Several epidemiologic studies have shown that consumption of food rich in polyphenols has beneficial effects on human health. Their antioxidant and anti-inflammatory properties have preventive effects on different chronic diseases such as cardiovascular diseases, diabetes, obesity, neurodegenerative disorders and cancer (Fraga et al., 2019; Li et al., 2014). Most polyphenols pass through the small intestine without being absorbed, thus encountering the gut microbiota (Ozdal et al., 2016). This has led to the development of a two-way mutual relationship between polyphenolic compounds and gut microbiota. First, polyphenols are biotransformed by gut microbiota that results in the increased bioavailability of their metabolites. The microbiota is responsible for the extensive breakdown of the original polyphenolic structures into low-molecular-weight phenolic metabolites that can be easily absorbed and may actually be responsible for the health effects derived from polyphenol-rich food consumption (Cardona et al., 2013). Second, polyphenols modulate the composition of the gut microbial community mostly through the inhibition of pathogenic bacteria and the stimulation of beneficial bacteria. The last is supported by their prebiotic properties enriching the beneficial bacteria (Valdés et al., 2015). Therefore, the interactions of dietary polyphenols and gut microbiota may impact human health.

Polyphenols characterization and bioavailability

Polyphenols are classified into a range of structurally related groups, with over 9000 different structures identified in various plant species. This heterogeneous group of molecules, divided into four main classes according to their chemical structure: flavonoids (including flavonols, flavanols, flavanones, flavones, anthocyanidins, chalcones, dihydrochalcones, dihydroflavonols and isoflavones), lignans, stilbenes and tannins. Phenolic acids (hydroxybenzoic, hydroxycinnamic, hydroxyphenylacetic, hydroxyphenylpropanoic and hydroxyphenylactic acids) are also frequently included in this category (Abbas et al., 2017).

Most dietary polyphenols exists as polymers or in glycosylated forms, in which one or more sugar moieties are bound to phenolic or a hydroxyl group at the C-3 position (Manach et al., 2004). The basic structure of flavonoids, meaning the structure of the aglycon form, and which type of sugar moiety is at-

tached strongly affect their bioavailability. Bioavailability is a crucial factor in determining their biological activity *in vivo* (Manach et al., 2005).

The bioavailability of dietary polyphenols is, in general, low. Small amounts of their intake (about 5-10 %) may be absorbed in the small intestine, mainly those with monomeric and dimeric structures. The released aglycones enter the enterocytes by passive diffusion. Once absorbed, polyphenols reach the liver through the portal circulation. Here, they undergo biotransformation via phase I (oxidation, reduction and hydrolysis) and phase II (conjugation) reactions. These transformations produce water-soluble conjugated metabolites (glucuronide, sulphate and methyl derivatives) which are released in the systemic circulation for subsequent delivery to organs and excretion by the urine. More complex polyphenols, especially oligomeric, and polymeric structures, reach the colon almost unchanged, where they are metabolized by the gut microbiota together with conjugates excreted into the intestinal lumen through the bile. Here, they undergo microbial enzyme transformations, including C-ring cleavage, decarboxylation, dehydroxylation, and demethylation. The result is the generation of less complex compounds such as phenolic acids and hydroxycinnamates (Corrêa et al., 2019).

Polyphenols and gut microbiota modulation

The human gut is an ecosystem of around 10^{13}–10^{14} bacterial cells, participating in several metabolic functions that the host cannot fulfil by itself. Microbiota that colonize the distal regions of the colon represent the highest concentration of microorganisms found in human body, as well as the most diverse. A harmonious balance in their composition has been associated with maintaining health and a higher life expectancy accompanied by a satisfactory quality of life (Nicholson et al., 2012). The mechanisms by which the phenolic compounds modulate the gut microbiota still remain to be elucidated, but may involve direct and indirect interactions. Phenolic compounds could directly stimulate or inhibit bacterial growth. Inhibition is closely related to the antimicrobial properties of these compounds and stimulation presumably associated with the capacity of the bacteria to metabolize them (Etxeberria et al., 2013). It could be said that polyphenols possess a selective bacteriostatic or bactericidal effect, inhibiting the growth of a wide range of potentially pathogenic bacteria and slightly affecting or even promoting the beneficial microbial population.

Some microbiota members are preferred to others due to efficacy they have shown in ameliorating the gut ecosystem with positive effects at the local and systemic levels. For this reason, most studies have focused on the effects of polyphenols on *Bifidobacterium* and *Lactobacillus*, which have been observed to contribute to human health at different levels (Gibson, 2008). They enhance gut barrier function, stimulate the host immune system, prevent diarrhoea or allergies, contribute to activation of provitamins, and modulate lipid metabolism (Burcelin et al., 2012; Gibson, 2008). However, there are other bacterial species associated with negative implications, such as *Clostridium dif-*

ficile, which has been associated with inflammatory bowel disease (Rastall et al., 2005). Therefore, it is of crucial importance to understand the inhibitory or stimulatory effect of phenolic compounds on beneficial or pathogenic bacteria. The influence of phenolic compounds on gut microbiota is summarized in details by Ozdal et al. (2016).

In vitro cell culture studies were performed by different polyphenol type substances. Among flavonols tested on six bacteria species (*Bacteroides galacturonicus*, *Lactobacillus* spp., *Enterococcus caccae*, *Bifidobacterium catenulatum*, *Ruminococcus gauvreauii*, and *Escherichia coli*) quercetin showed a dose-dependent inhibitory effect on the growth of all analysed bacterial species, whereas this effect was weaker for rutin (Duda-Chodak, 2012). In another study quercetin supplementation resulted in an altered composition of gut microbiota at different taxonomic levels, including the relative *Firmicutes:Bacteroidetes* ratio and inhibiting the growth of bacterial species associated with diet-induced obesity such as *Erysipelotrichaceae*, *Bacillus* spp., and *Eubacterium cylindroides* (Etxeberria et al., 2015).

Many different polyphenols were demonstrated to influence the growth of human gut bacteria and their adhesion to enterocytes. Accordingly, naringenin promoted the growth of *Lactobacillus rhamnosus*, commensal *E. coli*, along with inhibition of two pathogens, *Staphylococcus aureus* and *Salmonella* Typhimurium. In general, the Gram-positive enteropathogen *S. aureus* was the most sensitive to naringenin, while the Gram-negative pathogen *S.* Typhimurium and the commensal bacteria *E. coli* were likely to be similar in their sensitivity to naringenin (Parkar et al., 2008). The impact of naringenin and hesperetin was tested on six bacteria species (*Bacteroides galacturonicus*, *Lactobacillus* sp., *E. caccae*, *B. catenulatum, R. gauvreauii*, and *E. coli*) and inhibited the growth of almost all analysed bacteria (Duda-Chodak, 2012).

Isoflavones are transformed by gut microbiota, although there are few studies regarding the effect of isoflavone supplementation on gut microbiota composition. The investigated isoflavones (e.g. daidzein and genistein) induced a decrease in bacterial growth (Kawabata et al., 2013). The consumption of flavanol-rich foods containing epicatechin and catechin may support gut health through their ability to exert prebiotic actions (Tzounis et al., 2008). The flavan-3-ol modulates microbiota composition and inherent catabolic activity, inducing changes that could affect the bioavailability and potential bioactivity of these compounds (Cueva et al., 2013).

Anthocyanins and their metabolites may stimulate beneficial members of the gut microta community. Interestingly, malvidin-3-glucoside mixed with other anthocyanins exhibited a synergistic effect in promoting beneficial microbes. *In vitro* incubation of phenolic gallic acid in a fecal slurry reduced a group of potentially harmful bacteria such as *Clostridium histolyticum* without any negative effects on beneficial bacteria. In addition, it significantly reduced *Bacteroides* spp. growth and enhanced both the total bacterial number and the abundance of *Atopobium* spp. (Hidalgo et al., 2012). In another

study, the influence of hydroxycinnamic acids such as caffeic acid, chlorogenic acid, o-coumaric acid, p-coumaric acid on the growth of a probiotic microbe (*L. rhamnosus*), a commensal (*E. coli*) and two pathogenic bacteria (*S. aureus, S.* Typhimurium) was investigated. They compared the MIC values of all polyphenols tested and observed that flavonols, isoflavones and glycosides have low antibacterial activity, while phenolic acids were found to be at an intermediate level. On the other hand, the flavanone and flavanol had high antibacterial activity (Parkar et al., 2008).

The effect of hydrolysable tannins (ellagitannins) on the growth of intestinal bacteria is inadequately characterized, and generally their antimicrobial potential has been assessed *in vitro*. It was observed that pomegranate by-products and punicalagins inhibited the growth of pathogenic *Clostridia* and *S. aureus*. Interestingly, probiotic lactobacilli and bifidobacteria were generally not affected by ellagitannins (Bialonska et al., 2009). In this experiment, pomegranate extract was able to increase the total bacterial number, enhancing the growth of *Bifidobacterium* spp., *Lactobacillus* and *Enterococcus* groups, while no effect was observed for the *C. histolyticum* group (Bialonska et al., 2010).

Resveratrol, the representative of stilbenes, increased lactobacilli and bifidobacteria as well as diminished the increase of enterobacteria in *in vivo* studies (Larrosa et al., 2009) not representative from a dietary point of view. Our aim was to ascertain whether resveratrol can exert anti-inflammatory activity *in vivo* at an attainable dietary dose. Rats were fed with 1 mg of resveratrol/kg/day (a human equivalent dose). The results of another study showed that resveratrol ameliorates the dysbiosis in the gut microbiota induced by the high-fat diet, specific effects include an increase in the *Bacteroidete:Firmicutes* ratio, significant inhibition of the growth of *Enterococcus faecalis*, and increased growth of *Lactobacillus* and *Bifidobacterium* (Qiao et al., 2014).

The main limitation of the presented studies is that the information obtained from *in vitro* studies about the role of individual phenolic compounds on gut microbiota cannot be directly extrapolated to what occurs in the physiological context of the gut ecosystem. Of those performed, most were focused on a single polyphenol molecule and selected bacterial populations. Most phenolic fractions and pure phenolic compounds have been analysed without considering the bioavailability and the chemistry of phenolic compounds in the colon. Human and animal intervention studies involved very high doses of individual phenolic compound, or high amounts of foods rich in phenolic content, neither of which represents the regular diet (Ozdal et al., 2016). Therefore, there is a lack of adequate *in vivo* studies which are needed to understand the effect of phenolic compounds on gut microbiota. Human intervention studies will provide the best models for studying the effect of phenolic compounds on gut microbiota modulation. There may be a highly variable response to phenolic compounds according to the differences in gut microbiota composition. Future studies should provide answers about the inter-individual differences in

gut microbiota while studying the effect of phenolic compounds on gut microbiota modulation from the immunological point of view.

Conclusions

Dietary polyphenols have increasingly interested the scientific community due to their proposed health benefits. Possible beneficial effects of polyphenols are determined by their bioavailability where the gut microbiota have an important role. Phenolic compounds are biotransformed into their smaller metabolites by gut microbiota, which contributes to increased bioavailability. At the same time, phenolic compounds can alter the gut microbiota community, resulting in a greater abundance of beneficial microbes, and a consequent increase in bioavailability. Despite the results provided and published over recent years, future studies including human trials will give more confirmatory results about the efficacy of phenolic compounds at the gut level. These results may lead to the design of dietary recommendations not only to suppress or reduce symptoms in disease but also to provide the healthy population with simple tools to promote the maintenance of health.

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Change of Dietary Habits during Quarantine

Nives Bogataj, Karin Novak, Zala Jenko Pražnikar, Nina Mohorko
University of Primorska, Faculty of Health Sciences, Polje 42, 6310 Izola
bogataj.nives@gmail.com

Abstract

Introduction: Half of the world population was in quarantine in the beginning of April 2020, due to the outbreak of COVID-19. Preliminary research shows that good nutritional status and adequate physical activity (PA) lead to a better immune defence and prognosis in case of infectious diseases. However, people were at home most of the time and as a consequence very big lifestyle changes occurred. The aim of the present study is to investigate dietary changes during the latest quarantine. *Methods:* Forty-nine adults (16 men, 34.8 ± 9.1 years, BMI: 22.6 ± 2.7 kg/m2) included in the study filled out a food frequency questionnaire (FFQ) before and during quarantine. The participants were asked to answer where and how often they bought food and to report a more than 3 kg increase in body mass (BM) during quarantine. Twenty-two participants reported their general appetite on a 1-5 scale and on a 1-10 scale for appetite for sweet and snacks. They also completed a questionnaire about PA (International Physical Activity Questionnaire – IPAQ), before and during quarantine. Energy intake (EI), PA induced energy expenditure (PAEE), and Healthy Eating Index (HEI) were determined. Baseline and quarantine values were compared with the Student's paired t-test. *Results:* EI dropped from 9.68 ± 4.58 MJ/day (2311 ± 1093 kcal/day) at baseline to 7.89 ± 3.16 MJ/day (1885 ± 754 kcal/day) during quarantine (P=0.001), and PAEE dropped from 10.0 ± 7.9 MET/day at baseline to 5.0 ± 6.4 MET/day during quarantine (P=0.009). PA was lower due to lower work-related PA and free time PA. The average HEI was significantly lower during quarantine (baseline: 66.0 ± 14.8, quarantine: 63.3 ± 13.2; P=0.026) mostly due to lower intake of seafood and plant proteins, poorer ratio of unsaturated to saturated fatty acids intake (on the account of lower unsaturated fatty acids intake) and higher intake of sodium. Although general appetite remained unchanged (baseline: 3.87 ± 0.69, quarantine: 3.78 ± 0.74, P=0.58), there was a trend observed in increase of appetite for sweet (baseline: 4.43 ± 2.83, quarantine: 5.43 ± 2.61,

P=0.08). However, there were no statistically significant changes in appetite for snacks (baseline: 4.30 ± 2.27, quarantine: 4.91 ± 2.47, P=0.35). More than 80% participants bought food once a week or just once or twice in four weeks. Only three participants reported ΔBM > +3 kg during quarantine. *Discussion and conclusions:* Despite the drop of EI and PAEE during quarantine, diet quality was poorer during quarantine. Lower diet quality and less PA during first four weeks of quarantine were not reflected in more than 3 kg increase in BM in healthy lean adults.

Keywords: COVID-19 quarantine, diet quality, energy intake, physical activity

Introduction

On March 11th, 2020, the World Health Organization (WHO) declared the outbreak of COVID-19 to be a pandemic (WHO, 2020). In the beginning of April, half of the world population was in isolation or quarantine (Q) (Sandford, 2020), which are effective tools to prevent the spread of a new infectious disease (Cetron et al, 2004)and the practice was used widely in 14th-century Europe to control the spread of bubonic and pneumonic plague. To prevent disease transmission, ships were required to stay in harbor for 40 days before disembarkation (thus the term quarantine, which derives from the Latin quadragina or the Italian quaranta, meaning 40. In Slovenia, gathering of people in public was restricted and restaurants and cafes were closed (*Odlok o začasni splošni prepovedi gibanja in zbiranja ljudi na javnih mestih in površinah v Republiki Sloveniji,* 2020). Big changes in lifestyle occurred in a very short period. Many people worked from home, schools and kindergartens were closed, and people were at home most of the time. The rise in unstructured time, stress, and anxiety might further lead to overeating, sedentary behaviour, and weight gain (Pearl, 2020)COVID-19. Q affects food availability and the preparation of food as well (Gupta et al, 2005). Mass purchases of food, especially with long shelf life, took place in Slovenia which was reported by the local media (*Trgovine izropane,* 2020). Besides that, lay publications started to publish nutritional contents for food choice during Q (Jaklič, 2020). Online shops were congested due to a sudden increase in demand. On the other hand, in some areas of Slovenia, local food supply from growers and farmers was established. The ordered locally produced food was delivered to the buyer contactless (Penjak, 2020). Local food supply offered vegetable, fruit, and also fish, meat, milk, eggs and honey (Šubic, 2020).

It has been shown that people with a better nutritional status have smaller chances of infection and a better prognosis in case of infection (Zhang and Liu, 2020). It has also been shown that physical activity (PA) improves immune defence and may lower the severity of disease progression (Chen et al, 2020). Despite the previous country-wide Q in the outbreaks of SARS in 2003, H1N1 in 2009 and MERS in 2013, which took place in China, Taiwan, Canada, the United States of America, South Korea, and Saudi Arabia, there are no studies

of changes in diet during Q comparing nutritional data before and during Q. The aim of this study was to investigate changes in dietary patterns during Q.

Methods

Table 1: Components and Scoring Standards for HEI-2015. Modified from CNPP, 2018.

Component	*Scoring a*		*Standard for 0*	*Standard for max*
Total Fruits [b]	0-5	Higher intake → higher score	0	>140 g/1000 kcal
Whole Fruits [c]	0-5		0	>70 g/1000 kcal
Total Vegetables [d]	0-5		0	>176 g/1000 kcal
Greens and Beans [d]	0-5		0	>32 g/1000 kcal
Whole Grains	0-10		0	>43 g/1000 kcal
Dairy	0-10		0	>319 g/1000 kcal
Total Protein Foods [d]	0-5		0	>71 g/1000 kcal
Seafood and Plant Proteins	0-5		0	>23 g/1000 kcal
FA (PUFA+MUFA)/SFA	0-10		<1.2 g/1000 kcal	>2.5 g/1000 kcal
Refined Grains	0-10	Higher intake → lower score	>122 g/1000 kcal	<51 g/1000 kcal
Sodium	0-10		>2 g/1000 kcal	<1.1 g/1000 kcal
Added sugars	0-10		>26 % EI	<6.5 % EI
Saturated Fats	0-10		>16 % EI	<8 % EI
HEI = sum of the above	0-100		Higher score → higher diet quality	

FA – fatty acids; PUFA – polyunsaturated FA; MUFA – monounsaturated FA; SFA – saturated FA; EI – energy intake
[a] Proportional for intakes between standards for 0 and maximum.
[b] Includes 100 % fruit juice.
[c] All except juice.
[d] Includes legumes.

Participants were recruited by internet and social media to participate in a study, which was interrupted due to the pandemic. The inclusion criteria were age 18-60 years, absence of chronic diseases and stable body mass (BM) and absence of antibiotic use 3 months prior to first measurement. The exclusion criteria were change of diet in the last 6 months, and BM index (BMI) <18 kg/m^2 and >30 kg/m^2. 72 participants completed the first measurement before Q in January and February 2020 and were invited to fill in further questionnaires 4 weeks after the start of Q in Slovenia. 49 participants who filled in the validated food frequency questionnaire (FFQ) for Slovene population (Bizjak et al, 2014) and questionnaire on food-intake connected behaviour at baseline (B) and during Q were included in the present study. FFQ was analysed with OPEN Platform for Clinical Nutrition accessible online through the website http://opkp.si/ to obtain data on nutrient and energy intake (EI). Diet quality was evaluated with Healthy Eating Index 2015 (HEI) (Reedy et al, 2018) according to the developer's protocol (Table 1 (CNPP, 2018)). 22 participants also filled in the International Physical Activity Questionnaire (IPAQ) (Craig et al, 2003) but diverse physical activity measures in use prevent international compari-

sons. The International Physical Activity Questionnaire (IPAQ, and an appetite questionnaire at B and during Q. IPAQ data were used to calculate the PA induced energy expenditure (PAEE).

To evaluate whether Q had different effect on people with different diet quality, two groups were created: HEI>66 (participants with HEI above mean value on B, N=25) and HEI<66 (participants with HEI below mean value on B, N=24). HEI on B and Q were compared between groups.

The data were analysed using IBM SPSS 2.7 (IBM, USA). All variables were tested for normal distribution (Kolmogorov-Smirnov test); means and standard deviation were calculated. Student's paired t-test was used to investigate the effect of Q on the observed parameters.

Results

Table 2: Comparison of energy intake and diet quality between baseline and quarantine

	B	*Q*	*P*
EI [kJ]	9706 ± 4595	7917 ± 3167	0.001
HEI:	66.0 ± 14.8	63.3 ± 13.17	0.026
Total fruits	2.9 ± 1.7	3.1 ± 1.9	0.207
Whole fruits	3.4 ± 1.9	3.5 ± 1.8	0.513
Total vegetables	4.6 ± 1.2	4.7 ± 1.0	0.212
Greens and beans	3.3 ± 2.0	3.3 ± 2.0	0.850
Whole grains	4.5 ± 3.9	4.5 ± 3.8	0.971
Dairy	2.3 ± 2.1	2.6 ± 2.3	0.448
Total protein foods	4.0 ± 1.3	3.9 ± 1.2	0.508
Seafood and plant proteins	4.3 ± 1.2	3.8 ± 1.7	0.023
Fatty acids	4.5 ± 4.4	3.8 ± 4.3	0.070
Refined grains	9.3 ± 1.8	8.9 ± 2.5	0.166
Sodium	9.2 ± 1.9	8.3 ± 2.8	0.022
Added sugars	7.1 ± 2.5	6.6 ± 2.4	0.191
Saturated fats	6.5 ± 3.7	6.1 ± 3.7	0.259

EI – energy intake; HEI – Healthy Eating Index; B – baseline; Q – quarantine.

The mean participants' age was 34.8 ± 9.1 years, and the mean BMI was 22.6 ± 2.7 kg/m2. EI and diet quality on B and Q are presented in Table 2.

PAEE dropped from 10.0 ± 7.9 MET/day at B to 5.0 ± 6.4 MET/day during Q (P=0.009). PA was lower due to lower work-related PA and lower free time PA. Although general appetite remained unchanged (B: 3.87 ± 0.69, Q: 3.78 ± 0.74, P=0.58), there was a trend in increase of appetite for sweet (B: 4.43 ± 2.83, Q: 5.43 ± 2.61, P=0.08), however, there were no statistically significant changes observed in appetite for snacks (B: 4.30 ± 2.27, Q: 4.91 ± 2.47, P=0.35). More than 80% of the participants bought food once a week or just once or twice in four weeks. Only three participants reported an increase of BM >3 kg during Q.

After dividing the participants in two groups based on HEI scores on B, the groups did not differ in EI on B nor during Q. HEI dropped significantly only in HEI>66 (B: 78.3 ± 6.1, Q: 73.0 ± 7.1, P=0.000), while in HEI<66, HEI remained unchanged (B: 53.2 ± 9.2, Q: 53.1 ± 10.0, P=0.967).

Discussion

Our study was the first to compare nutritional data before and during Q. We observed a significant drop in EI which was surprising, as studies which retrospectively assessed changes in diet due to Q reported increased EI (Scarmozzino and Visioli, 2020). Change in EI might have followed the change in PA, which also dropped significantly during Q, due to lower work-related PA and less free time PA, which were direct consequences of the Q. Besides lower PA, other potential side effects of Q have been pointed out, such as weight gain and behavioural addiction disorders and lower diet quality (Lippi et al, 2020). Only three participants, however, reported an increase in BM >3 kg during Q, suggesting that the observed lowered EI was adequate.

Diet quality, on the other hand, did drop significantly. Significantly lower scores were observed for seafood and plant proteins and sodium HEI components which reflects limitations in fresh food acquisition during Q Most of the participants bought food just once a week or once or twice in four weeks. It was shown that food availability at home leads to a higher consumption of snacks and may lead to lower diet quality (Gorin et al, 2011). There was a trend in increase of appetite for sweet in our participants, but general appetite and appetite for snacks did not show any significant changes. Change in economic status and available time for food preparation could be the reasons for worsening diet quality. Many people assume that people have more free time during Q, but working from home, babysitting and teaching children may lead to less free time and more stress (Fister 2020). Interestingly, participants who had higher HEI before Q had significant drop in HEI score during Q, while HEI did not change in the group with lower HEI at B. This is worrying as people with a healthier lifestyle decreased its quality. Unhealthy diet and physical inactivity are risk factors for cardiovascular diseases, type 2 diabetes and metabolic syndrome (Paniagua 2016) obesity is a major public health problem, affecting in greater or lesser proportion all demographic groups. Obesity is estimated by body mass index (BMI, which themselves are risk factors for worse COVID-19 outcomes (Hamer et al, 2020). Higher PA and HEI were associated with lower risk of cardiovascular diseases, different types of cancers and all-cause mortality (Onvani et al, 2017). Q may thus have negative health consequences because of changes in lifestyle and diet. Prospective studies of metabolic markers are needed to observe that.

Conclusions

We observed significantly lowered EI and PA. Only three participants reported an increase of BM greater than 3 kg. Nevertheless, HEI during Q was significantly lower than on B, especially in participants who had higher HEI scores on B. Q may have negative health consequences due to its impact on everyday lifestyle and diet.

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Probiotics consumption in physically active individuals

Dominika Češek, Katja Bezek, Mihaela Jurdana

University of Primorska, Faculty of Health Sciences, Polje 42, 6310 Izola, Slovenia
cesek.dominika@gmail.com; katja.bezek@fvz.upr.si; mihaela.jurdana@fvz.upr.si

Abstract

Introduction: It is well known that physical activity (PA) recommendation has positive effects on individual's health status. On the other hand, low levels and excessive exercise can lead to negative consequences, influencing the immune system and changing the permeability of a gut barrier leading to a higher risk for infections and inflammation. Considering the link between gastrointestinal (GI) tract and symbiotic microorganisms, or microbiota, probiotics consumption might have an indirect influence on the health status of individuals with vigorous physical activity. There is an increasing number of studies describing the probiotic effect on immune and GI tract function, affecting the respiratory infections, and the performance of active individuals. This report provides data between probiotic consumption and the health status of individuals with different levels of physical activity. *Methods:* Literature review was focused on the effects of probiotics on health status of general and PA population. In questionnaire-based survey 33 individuals were included. The data regarding PA, eating habits, defecation and knowledge and use of probiotics were collected and analyzed. *Results:* Probiotics have a beneficial effect on health status and performance in PA individuals when consumed regularly and in adequate amount. Although the participant's knowledge about the term »probiotics« was acceptable, the knowledge about the source of probiotics in daily diet was insufficient. Probiotic consumption in form of foodstuff and dietary supplement in the selected population was inadequate. *Discussion and conclusions:* Due to the study limitations observed, e.g. small samples, short periods of probiotic consumption and choice of different probiotic strains, it is difficult to summarize the specific effect of the probiotic consumption on PA individuals. There is a need for additional studies with standardized protocols to confirm the health benefits of probiotics on individuals with

the same level of PA. Based on the questionnaire results we can conclude that the knowledge about probiotic consumption effects of younger generations is insufficient. On behalf of this study results there is a need for educational activities among younger adults also in the aspect of probiotics consumption in relation to PA.

Keywords: Gut microbiota, Probiotics, Physical activity

Introduction

Human GI tract is inhabited by a complex and dynamic population of microorganisms. This so-called gut microbiota has an important role in health and disease of the host. However, its diversity and density variates through the GI tract with the highest cell concentration in the lumen of the colon, where 10^{12} bacteria per gram of content can be found (Walburga et al., 2018). Although the adult-like gut microbiota is formed already in early life, factors such as antibiotics treatment, diet (Wen and Duffy, 2017) and PA can influence the microbial balance (Monda et al., 2017). At least 150 minutes of moderate PA or at least 75 minutes of high intensity activity has a positive health effect (WHO, 2011) that could be mediated also by PA's influence on gut microbiota. Moreover, aerobic activity in healthy individuals has been shown as successful in balancing and enhancing functionality of gut microbiota (Dalton et al., 2019). As the intensity of PA increases, GI symptoms can occur, e.g. nausea, cramping, bloating and diarrhoea, that can be linked to changed intestinal barrier function (Lamprecht and Frauwallner, 2012). Individuals with different levels of PA often consume foodstuff and dietary supplements which affect gut microbiota, e.g. probiotics and prebiotics (Colbey et al., 2018) to maintain GI health. Probiotics are defined as live microorganisms with beneficial effects of host's health if administered in sufficient amount (Hill et al., 2014). On the other hand, prebiotics are fermentable food components which have a beneficial effect on host's health through their impact on composition and/or gut microbiota function (Guarner et al., 2012). The aim of this study was to answer following research questions: a) "What are the knowledge and consumption habits of live microorganisms in individuals with different levels of PA?"; b) "Can probiotics consumption affect health status of individuals with vigorous PA?"; c) "Can probiotics consumption affect performance in in individuals with vigorous PA?".

Methods

Theoretical part of the study included literature review on gut microbiota, PA and probiotic consumption on health of PA individuals with the use of different research bases. The literature of the past 10 years was included. Practical part of the study included preparation of the questionnaire which was published on www.1ka.si and data analysis. The link to online questionnaire was shared through e-mail and social media to addresses of selected track and field clubs and PA individuals. All participants were informed about anonymity and

data use for research purposes only. Data was analysed with computer program SPSS Statistics 26.0 (IBM, Armonk, NY, USA) within connections between variables were processed.

Results

Probiotics consumption and its effects on physical activity

Results of literature review on probiotics consumption in individuals with different levels of PA are presented in Table 1.

Table 1: Effects of probiotic consumption on some health parameters in individuals with different level of PA

Probiotic strain	*Sample*	*Results (study duration)*	*Reference*
Bifidobacterium bifidum W23, *Bifidobacterium lactis* W51, *Enterococcus faecium* W54, *Lactobacillus acidophilus* W22, *Lactobacillus brevis* W63, *Lactococcus lactis* W58	Triathlons competitors, runners, cyclists	Lower levels of TNF- α for 25 % in resting state and after PA, lowering increased level of zonulin; (14 weeks)	Lamprecht et al., 2012
Lactobacillus fermentum VRI-003	Elite endurance runners	Reported shorter duration and lower severity of respiratory infections; (28 days)	Cox et al., 2010
L. acidophilus, *Lactobacillus delbrueckii* ssp. *bulgaricus, B. bifidum*, *Streptococcus salivarius* ssp. *thermophilus*	Endurance swimmers	Lower number of respiratory infections episodes, improved VO_2 max; (8 weeks)	Salarkia et al., 2013
Lactobacillus, *Bifidobacterium*, *Streptococcus*	Runners	Extended time of running to fatigue in environment with higher temperature; (4 weeks)	Shing et al., 2014
Bifidobacterium longum 35624	Swimmers	Reported enhanced recovery after PA in the last 2 weeks in offseason; (6 weeks)	Carbuhn et al., 2018

TNF- α... tumor necrosis factor alpha
VO2 max... maximum rate of oxygen consumption

Knowledge and consumption habits of probiotics in physically active population

In the present study 33 participants were included, 19 females (58 %) and 14 males (42 %) with mean age 19.12 years. Majority (94 %) has been running more than 2 years and 76 % of them were training with high intensity. 48 % of participants did not suffer any issues during running, the rest was experiencing breathing issues. Based on Bristol's Stool Chart (Chumpitazi et al., 2016) the most frequent stool form was type 3, a normal stool form. According to knowledge about the term probiotics the highest percentage (48 %) the answer was that they already heard for the term, but they did not know why are they beneficial. In 55 % family members were the source of information of probiotics. Only 37 % were consuming probiotic food, most commonly fermented milk

products, e.g. yoghurt and cheese. Only 2 participants consumed probiotic supplements. Most of the participants agreed with claims that probiotics have beneficial effects on immune system and regular defecation. Opinions differed on breathing issues claims, enhancing GI symptoms during running and the effect on performance. Based on normality of variables, Spearman's rank correlation coefficient was used and showed a trend of weak negative significant correlation (r_s = - 0,351; n = 33; p < 0,045) between variables age and time involved with running.

Discussion

Based on results of clinical studies, there is a trend that probiotics consumption can have an impact on health and performance in PA individuals, if there are criteria fulfilled, e.g. optimal strain use, frequent use and adequate amount of probiotics. Despite positive studies results, there are also limits, e.g. low number of studies, small study samples, short consumption time, incomparability of studies because of different doses and strains of probiotics, unsuitable control in PA and diet regime. Probiotics are often used with other compounds, e.g. prebiotics, protein supplements and antioxidants, thus the study comparison is even more complicated. Furthermore, there is still a lot unknown about probiotics mechanisms. Despite all the studies, the generalisation of probiotics effects and guidelines formation for individuals with different level of PA cannot be made. Moreover, since probiotic consumption can lower the concentration of inflammation parameters, which are important in process of recovery, hypertrophy and physiological adaptations on training, it could have a negative impact on PA. Third research question included data analysis of the given questionnaire. Knowledge about the term "probiotics" was good, although the same was not shown in probiotics sources and use. Since the main source of information were family members, participants could receive misinformation. Small number of participants consuming food with probiotics could also be linked to the low milk and milk products consumption, due to insufficient knowledge on probiotics and their effects. However, they agreed that probiotics have beneficial effects on immunity and regular defecation.

Conclusions

Despite the large number of studies of probiotics consumption in general population, the number of studies of probiotics consumption in PA population is still limited. Mainly, the positive effects of probiotics consumption on immune system, GI tract and respiratory system function and in performance and recovery after PA were observed. Furthermore, results are hardly or not comparable. Therefore, comprehensive meta-analysis should be performed before incorporating the probiotics into individuals diet regime based on the PA intensity. Based on the questionnaire results, we concluded that knowledge of younger generations about probiotics is limiting and could be introduced also by the nutritional counselling and workshops.

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The effect of probiotic ice cream consumption on salivary cariogenic bacteria in healthy adults

Dominika Češek, Katja Bezek, Boris Kovač

University of Primorska, Faculty of Health Sciences, Polje 42, 6310 Izola, Slovenia
cesek.dominika@gmail.com; katja.bezek@fvz.upr.si; boris.kovac@fvz.upr.si

Abstract

Introduction: Oral microbiota is one of the most important and complex microbial communities in the human body. Microbiota dysbiosis can however lead to common diseases, including dental caries and periodontitis, and also systemic diseases. Dental caries represents one of the most common chronic diseases worldwide and is characterized by the localized destruction of the mineralized tooth tissues caused by bacterial action. There is a positive correlation between dental caries, frequency and amount of consumed dietary sugars, together with other factors influencing its development, including oral hygiene, salivary flow and composition and also enamel defects. Additionally, *Streptococcus mutans* was shown as one of the most dental-caries related bacteria species. Since the traditional approaches are often insufficient in reducing the numbers of caries causing organisms, alternative approach such as probiotics consumption were proposed. Thus, the aim of the present study was to test the effect of probiotic ice cream on salivary cariogenic bacteria counts in healthy adults. *Methods:* In the double-blind, placebo-controlled study 11 healthy participants (10 females, 1 male), aged 20-50 years, were included. Saliva samples were collected using CRT® bacteria test at day 0 and after 2 weeks of ice cream consumption. Probiotic ice cream contained two probiotic strains *Bifidobacterium animalis* subsp. *lactis* BB-12® (nu-trish® BB-12®) in concentration of 2,8 x 10^8 CFU/g and *Lactobacillus acidophilus* (nu-trish® LA-5®) in concentration of 1,1 x 10^8 CFU/g. Participants also completed questionnaires about knowledge and frequency of probiotics and cariogenic food consumption and a questionnaire on ice cream opinion. *Results:* After 2 weeks of consumption, the salivary cariogenic bacteria count in the control group of participants were the same or even higher, when compared to day 0. On the other hand, for participants consuming probiotic ice cream, *S. mutans* counts were lower with corresponding

higher *Lactobacillus* counts. The total viability counts of probiotic bacteria did not change with time during 120-day storage. Although the participant's knowledge about probiotics was adequate, there was a lack of knowledge observed regarding the term "cariogenic food". *Discussion and conclusion:* Despite the small sample of participants, a trend of lower salivary cariogenic *S. mutans* and corresponding higher *Lactobacillus* counts were observed in participants consuming probiotic ice cream. Based on the results, probiotics consumption could be included in the prevention of dental caries, however larger-scale study should be conducted to confirm the significance of our results. Nevertheless, due to the observed lack of knowledge about probiotics and cariogenic foods the theoretical and practical approaches should be suggested for healthier eating habits of working-age population.

Keywords: oral microbiota, dental caries, Streptococcus mutans, probiotics

Introduction

Oral microbiota is one of the most important and complex microbial communities in the human body (Lamont et al., 2018). Moreover, there is an increasing number of evidences demonstrating that oral microbiota dysbiosis is associated not only with oral diseases (Li et al., 2019), including dental caries and periodontal disease (Costalonga and Herzberg, 2014), but also systemic diseases (Graves et al., 2018). Dental caries, one of the most common chronic diseases worldwide, is characterized by the localized destruction of the mineralized tooth tissues caused by bacterial action (Jin et al., 2015; Marsh and Zaura, 2017). The onset of dental caries is positively correlated to the amount and frequency of consumed dietary sugars (van Loveren, 2019), which can be mostly found in cariogenic foods. Additional host factors influencing dental caries development, such as oral hygiene, salivary flow and composition, and enamel defects, are also important (Lamont et al., 2018). Since *S. mutans* was characterised as one of the most common causes for dental caries development (Loesche, 1986) against which traditional approaches were not successful (Mahantesha et al., 2015), newer approaches such as probiotics have been tested (Anderson and Shi, 2006). Probiotics are live microorganisms which when administered in an adequate amount confer health benefits on the host (FAO and WHO, 2002). Regarding dental caries, the main goal of probiotic application is to replace cariogenic with noncariogenic bacteria (Twetman and Keller, 2012). As shown before, probiotics were shown to have a beneficial effect on oral health (Bonifait et al., 2009; Devine and Marsh, 2009). The aim of the present study was to investigate the effect of daily ice cream consumption containing probiotic strains *B. animalis* subsp. *lactis* BB-12 and *L. acidophilus* LA-5 on salivary *S. mutans* counts in healthy individuals.

Methods

In the present double blind, placebo-controlled study 11 healthy participants, ten females, and one male, aged 20-50 years, who met the inclusion criteria were included. Inclusion criteria involved restrictions of antibiotics and probiotic dietary supplements consumption, orthodontic apparatus, and cavity injuries. Participants were scheduled for 2 visits. In the first visit, they completed two questionnaires about the knowledge and frequency of probiotic and cariogenic foods consumption and gave saliva sample, followed by a 14-day period of 60 g ice cream consumptions. In the second visit, they completed the questionnaire regarding product feedback, followed by saliva sampling using CRT® bacteria test (Ivoclar Vivadent, Liechtenstein). The ice cream base is a trade secrete (Incom d.o.o., Ajdovščina, Slovenia), while probiotic ice cream contained two probiotic strains *B. animalis* subsp. *lactis* BB-12® (nu-trish® BB-12®) and *L. acidophilus* (nu-trish® LA-5®) (Chr. Hansen, Denmark) in final concentration of 2,8 x 10^8 CFU/g and 1,1 x 10^8 CFU/g, respectively. As negative control ice cream without probiotics supplementation was used. For the statistical analysis, Microsoft Excel 2016 and IBM SPSS version 26 were used.

Results

To begin with, most of the participants brush their teeth 1-2 times daily without the use of dental floss. The majority of participants (66,4 %) were familiar with the term "probiotics" and their use. However, 55,4 % of participants neither agreed, nor disagreed with the statement that probiotic consumption slows down the growth of microorganisms that cause caries in the oral cavity. Regarding the consumption of foods containing live microorganisms possessing probiotic properties, the most commonly reported were yoghurt and cheese, with minimal consumption amounts of 150 ml/week and 22,5 g/week. Lack of knowledge was observed in the category of "cariogenic foods", while the most frequently consumed cariogenic foods were fruit juice and ice cream, followed by jam and biscuits. Regarding cariogenic bacteria counts in saliva samples, the salivary *S. mutans* counts in the control group after 14-day ice cream consumption were the same or even higher compared to day 0 and for most cases there was no change in *Lactobacillus* counts. In the experimental group with 14-day probiotic ice cream consumption, salivary *S. mutans* counts were lower with corresponding higher *Lactobacillus* counts. Nevertheless, according to data of appearance, taste, scent and texture of the ice cream, participants liked the product.

Discussion

Obesity and dental caries are widespread pathologies, triggered by common etiologic factors, such as high added sugar consumption already in childhood (Delli Bovi et al., 2017). Furthermore, fermentable dietary carbohydrates, among which sucrose is considered the most cariogenic, are the key factors

involved in the initiation and development of dental caries (Paes Leme et al., 2006). Thus, low pH level as a result of carbohydrate fermentation, triggers a shift of cariogenic oral microbiota, resulting in enamel demineralization (Delli Bovi et al., 2017). Despite the low number of participants of the present study, their lack of knowledge about cariogenic foods is of big concern. Moreover, the cariogenic foods, defined with the presence of fermentable carbohydrates does not affect their shopping habits. In contrast to cariogenic foods, the knowledge about probiotics was better, since the majority of participants was familiar with the term and use. According to the consumption of listed foods, only 2 out of the 11 participants met the recommended daily intake of probiotic microorganisms. That should be a minimum of 10^6 CFU/ml of product (Boylston et al., 2004). Since the probiotics had been proven as successful in dental caries prevention, the aim of this study was to test the effect of probiotic ice cream on salivary cariogenic bacteria in healthy adults. Based on CRT values after participant's saliva sampling, it was shown that the used probiotic strains influenced salivary *S. mutans* counts which were lower compared to day 0. Probiotic ice-cream affected also *Lactobacillus* counts which is important for maintaining healthy oral microbiota.

Conclusion

Among participants a lack of knowledge about probiotics and cariogenic food was observed, therefore the theoretical and practical approaches should be suggested for healthier eating habits. Participants who consumed probiotic ice cream with 2 different probiotic strains had lower salivary cariogenic *S. mutans* counts and corresponding higher probiotic *Lactobacillus* concentration after 14-day ingestion period in comparison with participants in the control group. However, the main limitation of the study was low number of participants, thus a larger scale study should be conducted to confirm the significance of our results.

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Health problems experienced by parents of children in long-term hospital stay

Maria de Lurdes Lopes de Freitas Lomba[1], Inês Abreu[2], Rafaela Oliveira[2], Rodrigo Rato[2], Rúben Pinto[2], M. Sofia Macedo[3]

[1] Health Sciences Research Unit: Nursing. Coimbra Nursing School Nursing, Portugal.
[2] Coimbra Nursing School Nursing. Portugal.
[3] Saudi Patient Safety center, Saudi Arabia

Abstract

Introduction: Nowadays, parental active engagement in children' hospitalization has become an accepted feature. However, parental finance, social and personal costs for their involvement in their child's care have received little attention. Moreover, a child's hospitalization is, frequently, an event that occurs, unexpectedly, having a significative impact on parents' health. There is a positive relationship between parental anxiety and the length of the child's hospital admission. Aim: To synthesize and analyse the existing evidence on the health problems experienced by parents of children in a long-term hospital stay. *Method*: An integrative review was carried out, and scientific articles were selected from the databases MEDLINE, SciELO and CINAHL. Only parents of children (with ages between 0 and 18 years) submitted to long-term hospitalizations were included. Parents with any kind of mental or psychiatric disorder were excluded from the review. A six-step method was used to develop the revision and to analyse the results. *Results:* A child's hospital stay holds major changes in the routines and well-being of a family. Parents are in need of care from nurses whose primary focus are children. Children' hospitalization often leads to parental anxiety as well as stress and sleep disorders. This condition can also trigger other pathologies such as hypertension, obesity, diabetes mellitus type II or stroke. Anxiety has higher rates on mothers of male infants. *Conclusion*: A long-term child´s hospitalization brings an important and challenging parental adjustment affecting their health and well-being. Thereby, nurses' interventions should focus on identifying the adversities experienced by parents, so that actions can be taken that will improve the adaptation process, and consequently promote the parents' well-being in addition to their children's healing process. To this point, meeting family-centred care expectations is an additional paediatrics'

nurse challenge. Future studies on the strategies used by parents during their child's long-term hospitalization and its evaluation are needed.

Keywords: long-term hospital stay; parents; anxiety; stress; sleep disorders

Introduction

Parents have an important role on their children health care. While the focus of healthcare professionals is mostly the child; the financial, social and emotional impact on the child's parents is, often, overlooked. Considering that a child's hospitalization is, in most cases, unexpected, Melnyk (2000) affirmed that hospitalization could be a stressful situation for children and their parents/families, which may interfere with the care provided and thus with the recovery of the child.

As children's recovery depend, not only on the medical care, but also in the care and affection they may receive or not, it is crucial that nurses provide attention to the child, in addition to their technical expertise (Teixeira Luz et al., 2019).

Health care professionals must be sensitive to the parent's emotional needs as parents are an integrative component of the holistic care provided to the child. This is important as the parental presence and active participation during the child's hospitalization positively influences the health reestablishment due to stress reduction caused by the child's exposure to the hospital environment (Teixeira Luz et al., 2019). Yet, each family has different coping strategies, and it becomes extremely important for nurses to provide an individualized plan of care (Erdem, 2010), demonstrate empathy, compassion and kindness to engage with the children and their parents (Micalizzi et al., 2015), holistically.

A child's hospitalization may trigger parental stress, surface symptoms of anxiety and depression which will compromise their ability to give their child, proper support. (Nicholaou and Glazebrook, 2008). Given this, nurses should incite parents' ability to cope with these symptoms (Cescutti-Butler and Galvin, 2003). The partnership in care between parents and nurses allows, not only, for sharing of expertise, but it also provides an important sense of control from the parents over their child's hospital care as well as it builds a vital relationship of trust and confidence towards the healthcare team. (Mimmo et al., 2019).

Although the negative impact of long-term hospital admissions on parents are recognized, there is a dispersion of knowledge in the literature, which hampers the synthesis of best available evidence and thus its application into clinical practice. To achieve the proposed objective, the defined research question is: "What are the health problems experienced by parents of children in long-term hospitalization?"

Method

The search was performed in March 2020, with the aim to identify health problems experienced by parents of children in long-term hospitalisations.

The review is a result of six phases: 1) guiding question definition; 2) literature search; 3) studies' categorization; 4) included studies' appraisal; 5) results interpretation and 6) synthesis. Research was carried out using the EBSCOhost search engine, selecting CINAHL Plus with Full Text and MEDLINE with Full Text as databases, with a timeline defined between 2015 and 2020, with the purpose of obtaining the most recent scientific evidence. The search was made in Portuguese and English and included the keywords "hospitalized children"; "parents"; "health problems" and the different synonymous of each keyword. Additionally, inclusion and exclusion criteria were defined. Thereby, only studies including parents of children of paediatric age (as per the study definition of paediatric age) in long-term hospitalisations were accepted for the review. Studies including parents who suffered from mental illness were excluded.

The search resulted in an initial sample of 149 scientific studies. Of these, 44 were excluded due to repetition, 87 based on title and abstract, resulting in a final sample of 18 articles. After full-text reading of the 18 studies, 13 were excluded for not meeting the inclusion/exclusion criteria. The final sample resulted on five studies that answered the investigation research question and met the inclusion criteria. (table 1)

In order to establish the internal validity and mitigate the risk of bias during the selection process, the methodological quality of the studies was assessed using the Joanna Bridge Institute tools (JBI Reviewer's Manual, 2020).

Table 1: Identification of the included studies

	Author	*Title*	*Country/Year*
A1	Aftyka A., Rybojad B., Rosa W., Wróbel A., Karakula-Juchnowicz H.	Risk factors for the development of post-traumatic stress disorder and coping strategies in mothers and fathers following infant hospitalization in the neonatal intensive care unit.	Poland, 2017
A2	Hye-Yul H., Shin-Jeong K., Wayne E. K., Kyung-Ah K.	Factors influencing the caregiving performance of mothers of hospitalized toddlers with acute respiratory diseases (ARD): a path analysis.	South Korea, 2018
A3	Lakkis A., Khoury M., Mahmassani M., Ramia S., Hamadeh N.	Psychological distress (PD) and coping strategies in parents of children with cancer in Lebanon.	Lebanon, 2016
A4	Nassery W., Landgren K.	Parents' experience of their sleep and rest when admitted to hospital with their ill child: a qualitative study.	Sweden, 2018
A5	Woolf C., Muscara F., Anderson V. A., McCarthy M. C.	Early traumatic stress responses in parents following a serious illness in their child: a systematic review.	Australia, 2015

Results and discussion

The type of studies included in this review are observational (A1), cross- sectional (A2 and A3), qualitative exploratory interview (A4) and a systematic review of the literature (A5). All studies focused on parents of hospitalized children due to a variety of diseases, such as cancer, respiratory diseases, amongst others. Samples of the studies range from 17 to 460 parents. All the five studies present coping strategies used by parents of hospitalized children to deal with their struggles. Results were categorized and presented according to four different themes:

Parental anxiety

The A2 study highlights that the number of hospitalizations and the mother's anxiety had a negative impact in the caregiving performance while the mother-child relationship, if shown to be healthy, has a positive impact in the mother's caregiving performance. Also, this relationship, proved to positively impact the mother's anxiety. Melnyk (2000) corroborates these ideas stating that heightened anxiety often inhibits mothers from parenting their children effectively during hospitalization. Therefore, they are less likely to fulfill their protective, nurturing, and decision-making roles. In view of this, paediatric nurses need to plan interventions to minimize mother's anxiety and uncertainties regarding her child's illness, plan of care and prognosis, which should improve her effectiveness as a caregiver.

Sleep quality

The A4 study states that enough sleep is vital for parental functioning while they stay in the hospital with their children. As parents' priority is their child's well-being, they focus on the child, putting their own needs aside. Poor sleep makes parents more irritable with one another and understanding information and making healthcare decisions becomes challenging. Additionally, it is difficult to maintain a positive attitude and bright thought about the future, making the stay at the hospital more difficult to manage.

Environmental, interpersonal and organizational factors intervene in the quality of sleep. From the environmental perspective, parents reported that sounds from the hospital machines and noises of nurses during the night interfere with their sleep. Regarding interpersonal factors, parents who had relatives with whom they could share the child's care described it as an opportunity to catch up with their sleep. Accounting for the organizational factors, parents mentioned bureaucracy as an aspect that could develop stress and frustration even before time of admission. Løyland et al, (2020) validates these findings as they declare that the cohabiting with others, lack of privacy, noise and light when trying to sleep, disruptions due to treatments and child related and family factors affect parents' sleeping patterns. Sleep quality is also jeopardized

when parents describe the shortage of healthcare providers as a potential risk for patient safety.

Parental stress

All three studies A1, A3 and A5 reported high prevalence of parent's stress disorder. A1 states that mothers felt greater stress and presented a higher severity of post-traumatic stress disorder (PTSD) compared to fathers, especially if they had previous miscarriages or chronic diseases. Accounting for the fathers, the Apgar test after birth and partner's PTSD were related to PTSD. Similarly, findings of A5 study indicate that psychosocial factors, such as prior trauma, history of mental issues, trait anxiety and parent perception of life threat to their child, were consistently associated with parental acute and posttraumatic stress symptomatology. A study based on this theme carried out by Board and Ryan-Wenger (2002) adds that one of the most significant stressors for parents was the alteration in parental role. Interestingly, although the threat or salience of death may appear critical in the development of traumatic stress disorders in parents, many studies reported no association between objective medical characteristics (such as length of hospital stay, severity of illness, length of ventilatory support, and risk of mortality) and traumatic stress symptomatology in parents.

Study A1 reported that the differences in stress coping strategies among mothers and fathers are gender-related. Women used the following strategies more often than men: seeking emotional social support, religious coping, focusing on and venting emotions, positive reinterpretation, and growth (active coping) and acceptance (avoiding behaviour). Inside the group of parents mourning for their baby, women frequently coped with stress by focusing on emotions than the men. A study held by Tehrani et al, (2012) enhances that a higher level of family stress can reduce the ability of the mother to cope with problems. The occurrence of PTSD symptoms depends not so much upon the stressor but on how one copes with stress. Therefore, according to A3, maintaining family integration/strength and optimistic outlook for the situation was perceived as being the most helpful coping strategies. Tehrani et al. (2012) highlights the importance of understanding the differences related to stressors perception among nurses and parents, throughout a child's hospital stay. If not managed properly, strategies that aim at reducing parental stress may not be effective. Therefore, special attention should be given to identify the stressors in nursing care, planning and parents' education, moving stressors and treatment in the same direction, and identify factors that can reduce the mother's ability to provide childcare and delay in treatment progress. Also, information provision about a child's diagnosis was reported as a protective coping mechanism for parents and found to be associated with feelings of empowerment.

Interpersonal relationships

A long-term hospital stay with an ill child has consequences on interpersonal relationships. According to the parents' interviews from A3 study, a long-term stay gives a feeling of unhappiness and isolation from the world outside the hospital. Callery (1997) declared the mothers' sense of isolation and the lack of support they were able to draw on from immediate family. Eyigor et al. (2011), states that the fear of the child's death, the length of the treatments, treatment-related drawbacks, distance from the caregiver's home to the hospital, financial problems, and negative effects on family relations tend to cause family psychosocial problems. Still, by being united as a family, parents felt stronger during their time of admittance. Spouses, relatives, and siblings served as a support system that help the parents as well as the ill child both practically and emotionally. Similarly, A2 shows that family support and positive emotional exchanges affect both the mother's and child's emotions. Also, a good parent–child relationship was associated with better outcomes related to the child's psychological functioning and family adaptation.

When considering coping strategies to deal with the hospitalization and the decay of relationships, a coping pattern in which parents maintain social activities and relationships, self-esteem, and psychological stability was found to have a significant protective role in parental adaptation to childhood disease, as shown by A3 study. The same coping pattern was found by the authors of A4 study, as all the participants described the importance of living their life as "normally" as possible including activities that reminded them that life had other meanings despite the child's disease, which was deemed as helpful to relax. Those having relatives and spouses bringing food so they could eat together, described that as creating a more home-like environment, which enabled the family functioning; however, since hospital wards only allow one parent during nighttime, the family members got separated which was described as difficult. Also the results of a study lead by Mason (1978) suggests that recurrently fathers are lead to believe, by the hospital's policy, that they are not supposed to be at the child's bedside and somehow blame themselves for not protecting the child. Fortunately, parents are becoming more aware of their rights, as well as of the value to the child of their visiting freely or rooming-in. The A3 study enhances that maintaining family integration/strength and optimistic outlook for the situation was perceived as being the most helpful coping strategy.

Parents at a hospital, inevitably connected with other parents and the medical staff. A4 study reveals that, even though all the parents wanted separate rooms, some of them mentioned positive aspects with having other families' sharing rooms, such as sharing the same experience and giving one another advice, becoming thereby significant partners in the treatment team, as reported by Mason (1978). By being on the "same boat", parents meant that their support and recommendations were invaluable. Also, talking with the health professional about concerns was among the top 10 most helpful cop-

ing mechanisms to parents, as reported by the A3 study, which highlights the importance of providing understandable medical information to parents and children, upon their request. The A4 study states that relationships with nurses were described as very positive as they lessened the parental burden by providing practical support with the treatment of their child and decreased emotional stress by continuous information.

Conclusion

Parents who accompany their children during a long-term hospitalization may develop anxiety, stress and sleep pattern disorders and alterations in the interpersonal relationships. Although parents prioritize their child's best interests, the impact that the hospitalization can have on their health is highlighted as parents are aware of the deterioration of their health condition.

Being these in mind, nurses must adapt their interventions to minimize the impact of hospitalization effects. Negotiation may be the key to the success of the hospitalization, as it improves the quality of care for the hospitalized child. Clarification of the role of nurses and parents in the caring process is one of the prerequisites of this negotiation.

Throughout the evidence synthesis conducted, health units must develop clinical guidelines for interventions to promote parents' sleep and rest, as well as the implementation of effective educational programs to help mothers and fathers enhance their knowledge and skills and participation in the care, with the aim of optimizing their parenthood. Achieving greater psychological support and having as a basis of care the creation of a good working relationship and empathy, will establish parents a viable support for moments of greatest discouragement and stress.

There is already an accessible amount of studies related to some of the health problems experienced by parents of children in long term hospitalizations, with the great majority referring to parental stress and anxiety. Nevertheless, a greater scarcity when the main theme concerns sleep pattern disorders and alterations within the interpersonal relationships. Changes and disorders in terms of eating patterns should be a topic to be addressed with greater attention in future researches. Whilst there is already some research foundation on the theme, there is a need for a more in-depth and targeted search for physical, mental and social changes in parents of children going through long-term hospitalizations in order to identify risk groups, determining factors and strategies to support and solve the problems encountered by this research.

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Use of information telecommunications technology in asthma subjects

Tilen Dolinar, Lidija Jakupović, Urška Ugovšek, Andrej Starc

University of Ljubljana, Faculty of Health Sciences, Zdravstvena pot 5, 1000 Ljubljana, Slovenia
tilen.dolinar@gmail.com, lidija.jakupovic@gmail.com, ugovseku@gmail.com, andrej.starc34@gmail.com

Abstract

Introduction: Asthma, a chronic respiratory disease affects approximately 235-334 million people worldwide. It is one of the most common pulmonary diseases in adults. Despite extensive effective treatment that has existed for decades, most asthma patients still have uncontrolled symptoms. Health information and communication technology has been used in healthcare to persuade the self-management of various chronic diseases. Mobile health applications could provide inexpensive and clinically effective asthma control measures. *Methods*: We used a descriptive method of research with a review of Slovene and foreign literature. The literature search was conducted from April 2020 to May 2020. The age of the literature was limited from 2010 to 2020. The literature was searched in the CochraneLibrary, CINAHL, PubMed and MedNar databases using keywords: information and communication technology, asthma, self- management, chronicillness, application. In the search for literature with a combination of the following keywords: information and communication technology, asthma, self-management, chronic disease, application. The selection criteria was the availability of the text in its entirety and the literature published in the period from 2010 to 2020. Articles that do not have a complete article structure, articles that do not relate to the topic of asthma were excluded. 16 articles were reviewed, 8 articles were excluded. *Results:* Mobile applications promise to improve behavior in asthma patients through self-management. Researchers report that about 2/3 of patients have expressed interest in using an asthma management app to improve the inhaler grip, a well-known problem among asthma patients. Currently, mobile applications alllow patients to monitor and manage their illness, obtain data, educate about the disease, and improve their health behavior. In addition to applications, smart inhalers could be put into use that improve the patient‘s quality of life and limit the

excess use of health care. *Discussion and conclusions:* Information and communication technology in healthcare could be used in chronic diseases such as asthma, as they are relatively cost effective and can have a significant impact on improving chronic disease management and human health.

Keywords: information and communication technology, asthma, self-management, chronic illness, application

Introduction

Asthma, a chronic respiratory disease, affects approximately 235-334 million people worldwide. It is one of the most common pulmonary diseases in adults. Despite the widespread of evidence-based guidelines and effective treatment that has existed for decades, most asthma patients still have uncontrolled symptoms. A patient with asthma has daily symptoms in a short-acting inhaler more than twice a week, wakes up at night due to symptoms or should definitely enter activities due to asthma. Sharing measures self-management of asthma management are key to reducing the harmful physical and economic impacts associated with this disease (Pool et al., 2017). Because asthma causes prolonged inflammation in the lungs, airway involvement severely restricts airflow during respiration, causing the patient to have difficulty breathing. Patients with asthma need two types of inhalation medications: for prevention seizures take inhaled corticosteroids to suppress the inflammation and when symptoms such as coughing or wheezing occur, all bronchodilators known as a soothing or rescue state. The most common problems that occur are improper grip of the inhaler, improper use of the inhalation itself and thus reduced absorption of the drug. The goal of asthma treatment should be dosed to maintain disease control and treatment. This requires an approach tailored to pharmacological treatment, patient education, a written action plan, training on the proper use of inhalers, and a review of inhaler technique at each outpatient visit (Zhifang et al., 2019).

International guidelines emphasize the importance of a partnership between patients and healthcare professionals. Despite all these claims, many health professionals do not pay sufficient attention to education and self-management (Zhifang et al., 2019). There is evidence that patients are not prescribed enough check-ups and do not have appropriate advice and instructions, most often this includes proper use of the inhaler. It is estimated that only 55% of adults with asthma learn to recognize early asthma symptoms, only 47% receive instructions to change the environment in which they live to improve asthma control, and only 33% have ever received an asthma treatment education plan (Pool et al., 2017).

Methods

In order to present the theoretical background and achieve the purpose of the work, a critical review of professional and scientific Slovenian and English lit-

erature was first performed. A literature search was conducted from April 2020 to May 2020. Literature was searched in the CochraneLibrary, CINAHL, PubMed, and MedNar databases. We used literature published between 2010 and 2020. We searched for literature with various combinations of the following keywords: information and communication technology, asthma, self-management, chronic illness, application. When searching for Slovenian literature, we used combinations of the following keywords: information and communication technology, asthma, self-management, chronic disease, application. The selection criteria was the accessibility of the text as a whole. Based on the existing literature, we analyzed the use of information and telecommunication technology for people with asthma.

Results

Asthma is the most common chronic disease among children and also affects millions of adults. The U.S. health care system costs about $56 billion a year due to its high prevalence and continued treatment throughout the lifetime of most asthma patients. Health information and communication technology has been used in healthcare to persuade the self-management of various chronic diseases such as asthma, diabetes, chronic obstructive pulmonary disease, etc. In particular, mobile health applications could provide low-cost and clinically effective asthma treatment measures. Applications could allow patients to self-manage asthma on a daily basis providing evidence-based interventions. Research has shown that procedures such as disseminating educational methods and tools to monitor symptoms improve a patient's quality of life and limit the overuse of health care services. Data obtained from mobile phone sensors and medical devices such as smart inhalers can be used to implement self-management measures tailored to the specific needs of patients (Tinschert et al., 2017).

As the use of mobile devices and smartphones becomes more common, patients can use asthma self-management apps. Currently, applications on mobile devices can enable patients to monitor and control disease, obtain data, educate about the disease, and improve health behavior (Zhifang et al., 2019). Mobile apps promise to improve behavior for asthma patients through self-management, as they can be easily incorporated into daily life. Smart mobile devices have many advantages, one of which is that they are usually always at hand, they are portable and are low cost. Researchers report that approximately 2/3 of patients have expressed interest in using an asthma management app to improve inhaler adhesion (Jácome et al., 2019).

The potential of applications to improve asthma self-management varies greatly between applications. Physicians and asthmatics should therefore read application reviews carefully before deciding which application to recommend or use. In addition, currently available asthma applications unfortunately do not take full advantage of today's technology. (Tinschert et al., 2017). Traditional self-management programs should include a written action plan on

how to identify and respond to asthma exacerbations, an individualized treatment plan, including self-monitoring and goal setting, medicine management including warnings and reminders and patient education (Honkoop, 2017).

Asthma subjects could use smart inhalers too. They are connected to a smartphone with a Bluetooth connection, remind patients when to take medicines, collect data to help with care, and improve patients commitment to taking asthma therapies. Smart inhalers contain a battery and measuring sensors which identifies the dose, and if a dose has been missed, they send patients reminders of missed doses. Sensors that measure the inhalation profile confirm that the dose was inhaled along with useful information about the inhaler technique. They also record the time of activation (Henry, 2019).

Discussion

Asthmatics could use mobile applications that allow patients to self-manage asthma on a daily basis providing evidence-based interventions. Using asthma apps as part of the set of strategies available to healthcare providers to improve quality of life among asthmatics, but it is hard to decide which app is the most suitable (Tinschert et al., 2017). Because research has shown that the inhalation technique is still a major problem for asthmatics, the use of smart inhalers that can recognize adhesion and inhalation technique is advised (Henry, 2019).

Conclusions

Given that chronic diseases account for as much as 75% of health care costs, it is crucial to identify simple tools to help patients care for them and improve outcomes. Online tools could also be used for other chronic diseases, as they are relatively cost-effective and can have a significant impact on improving the management of chronic diseases and human health. ICT can improve asthma control and the quality of life of asthmatics (Pool et al., 2017).

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Nurses' shift work: impact on health

Lidija Dornik

College of Nursing in Celje, Mariborska cesta 7, 3000 Celje
University Clinical Centre Ljubljana, Zaloška cesta 7, 1000 Ljubljana, Slovenia
lidkad@gmail.com

Abstract

Introduction: Work is important for the survival and personal attainment of individual people, but it also affects the lifestyle of people who are in the work process and leads to various health problems that employees are facing. Shift work and night work are associated with burnout, lack of personnel and lack of control effect on burnout, personal exhaustion, long working hours are associated also with excess body weight. Quality of life, tiredness, sickness, effectiveness and overall satisfaction with the work of nurses reflects the employer 's sense for an appropriate time schedule, relaxation, psychological support and access to relaxation spaces. *Methods*: We used descriptive research method. We used the method of reviewing of the scientific literature based on accessibility, content relevance and actuality. We accessed it via an electronic link in the Celje Library. The restrictive criteria were the period January 2017 to April 2020, English language, availability for download, full text and scientific journals with the keywords "nurse", "shift work", "night shift" and "health" in the EBSCO and MEDLINE databases. The survey was conducted in April and May 2020. MS Word was used to display the results. *Results*: We have used, reviewed and processed 21 full-text articles for a review scientific article, after applying the inclusion criteria: nurse, working conditions, type of work, health link, type of publication, time period, language and availability of the full text, so 11 scientific articles are included in the final research. We found out that night work with many factors has a negative impact on the health of nurses. This is manifested as burnout, exhaustion, fatigue, depression, anxiety, concentration, chance for defects, back pain, poor eating habits, all of which have a profound effect on stress levels. The quality of sleep is also worse, the pattern of sleep is broken and insomnia increases. *Discussion and conclusions*: Findings show that nurses who work shifts and also do night work feel poorer quality of life, poor quality of sleep, higher

stress level at work, have less time for family, social contacts and physical activity and are more prone to overweight and development of chronic diseases. All this is of concern for the general well-being of nurses and their health. Employers should be able to well organize the shift work, rest days and the workload of nurses. This would make it easier to maintain, promote the good psychophysical status of nurses and increase healthy lifestyles and health levels of employed nurses through patient-centered examples.

Keywords: nurse, shift work, night shift, health

Introduction

Work is important for the survival and personal achievement of individual people, and at the same time work affects the lifestyle of people who are in the work process and leads to various health problems. (Ferriera dos Santos et al., 2018). The work of nurses takes place in shifts and cycles, it also includes a night shift, which usually means 12 hours, from evening to early morning. Schedules are poorly defined, include compulsory work, voluntary, forced, extended work and on-call time, and payments are poorly defined. During this time, the nurses have to work to combat their natural instincts, disrupting their natural circadian rhythm, which is regulated by natural light and darkness, resulting in lack of sleep and fatigue. Many nurses report exhaustion, extreme drowsiness during the workday, decreased attention, lack of sleep or long-term insomnia, as well as falling asleep during work. (Douglas, 2014, Antill, 2016, Wheatley, 2017). The so - called long working days, 12 - hour working days, bring less costs for the employer. Continuity of care increases, resulting in more injuries at work, reduced patient safety. Shift work and night work with overcrowding, lack of staff, lack of control, are associated with burnout and personality exhaustion. Some countries have already successfully regulated the work of nurses and the overtime they perform, and this is the right path to the well-being of nurses and their impact on their health. (Dall'ora et al., 2020a, Dall'ora et al., 2020b, Young, et al., 2018, Wheatley, 2017).

Hospitals are one of the most stressful environments where nurses are under the greatest impact. Either due to physical discomfort, psychological pressures, dysfunctional support of the work environment and negative social support of the work environment. The quality of life, fatigue, morbidity, effectiveness, and overall satisfaction with the work of nurses reflects the employer's attitude (Shamloo, Moradi, Hosseini, 2020). Nurses are the first line of health care that cares for the nation (Williams, 2017). They represent public health, and influence the patients and their families by example, indicating healthy lifestyle, eating habits and risk management. Excess body weight and obesity is markedly higher among nurses as the work environment for nurses is not conducive. The knowledge nurses have about a healthy lifestyle does not match their lifestyle. The health and satisfaction of employed nurses affects the work

and the organization in which they are employed (Ferriera dos Santos et al., 2018, Stanulewicz et al., 2020, Williams, 2017).

In the research project, we would like to present, investigate whether shift work affects the health of nurses, based on a literature review, literature search strategy and restrictive criteria. Research objectives:

- compare the findings of experts in research on the effects of shift work on the impact on the health of nurses,
- determine whether nurses detect changes during shift work,
- determine whether the impact of shift work on the health of nurses can be determined by measurements,
- describe the health effects of shift work.

Methods

The research was based on a descriptive research method. The scientific literature in the field of medicine was used in the research project. The selection of literature was based on accessibility, relevance and topicality, and innovative research was included, which supported its results with evidence. The literature was accessed via an electronic link in the Celje library. Material for the research paper was collected online in the databases EBSCO and MEDLINE, ProQuest and Google Scholar. In order to narrow the data, restrictive criteria were used: peer-reviewed articles, full text, year of publication for 2017 - 2020, language, if available for download, professional and scientific journals, with the keywords "nurse", "shift work", "Night shift" and "health". Search found 21 articles. Article review strategy: We have already excluded all articles online where there was no visible content, or they were in a language, other than English. A review of the databases gave us 21 results, after the review we eliminated 3 articles that did not contain basic criteria. The remaining 18 articles were read and reviewed, and 7 more articles were excluded according to the inclusion and exclusion criteria. The other 11 articles were included in the survey for the review article. The survey was conducted in April and May 2020. MS Word was used to display the results.

When searching for articles, we decided to include the inclusion and exclusion criteria shown in Table I. The inclusion criteria were that nurses or health professionals were involved, that working conditions were shift work or night work, that there was an impact on health, that the article was freely published in the period from January 2017 to January 2020 in English and accessible as full text.

Table 1: Inclusion and exclusion criteria

Criteria	*Inclusion criteria*	*Exclusion criteria*
Healthcare worker/nurse	Healthcare workers or nurses included	All other professions
Working conditions	Shift work/night shift work	Only day shifts
Impact on health	Present in text	Not present in text
Type of publications	scientific review, research articles	Other type of articles
Time period	January 2017 – April 2020	Older literature
Language	English language	All other languages

Results

Shift work can have detrimental effects on human health. In Table 2 the results of our research, which includes 11 articles, are shown. It lists the author, methodology, purpose, sample, and finding.

Table 2: Author, year and country, type of study, duration, and intervention, aim, environment and sample and results

	Author, year, and country	*Type of study, duration, and intervention*	*Aim*	*Environment and sample*	*Results*
1.	Hayashi et al., 2020 Japan	Questionnaire surveys 2x 1 year (2015 – 2016)	Investigate patient safety management system and activities and intention to participate in the second survey in relationship with working hours in a week, the number of night shifts in a month and the number of days off in a month	40 hospitals 100 healthcare workers	Long working hours, night, shifts and few days off, were associated with low patient safety culture
2.	Behrens et al., 2019 Germany	Psychomotor Vigilance Task (PVT) test bout at the end of two consecutive day and three consecutive night shifts, respectively. 3 years (2012 – 2015)	To mean reaction time, percentage of lapses and false starts	75 female employees working day and night shifts, 25 year or older, not pregnant tor breast feeding within the last 6 months, not taking ovarian stimulation therapy, not have previous diagnosis of cancer	At the end of night shifts reaction times increased and number of lapses are higher compared to day shifts. Differences between in the number of false starts they didn`t observe. Reaction times improved across consecutive day and night - shifts, frequency of lapses increased after the third night

	Author, year, and country	*Type of study, duration, and intervention*	*Aim*	*Environment and sample*	*Results*
3.	Fujii et al., 2019 Japan	Self - reported questionnaire 1 year (2015 – 2016)	If they have lower back pain in the last four weeks, and if it lasted for more than 3 months	12 hospitals 3.066 nurses (no lower back pain 1.265, with lower back pain 1.801)	Prevalence of lower back pain is high among Japanese nurses and interfered with their work. Fear avoidance beliefs about physical activity might be potential target for lower back pain management.
4.	Dehring et al., 2018 Australia	Cross – sectional study 1 year (2013)	Organisational climate factors and health outcomes differed across shift types	Two healthcare services in Melbourne 108 nursing staff	Organisational climate, focused on increasing supervisor support may mitigate the potential negative health outcomes experienced by shift workers
5.	Chatterjee, Saha, 2018 India	Quantitative and survey research	Mental health status and quality of sleep among nurses of critical and general ward	70 critical ward nurses 70 general ward nurses	No significant difference of two wards on mental health status, poor quality of sleep - in critical ward
6.	Owens, Moultrie, 2017 USA	On – line survey 2 weeks	Find out relationship between lack of sleep and the effects on Quality of Life, how shift work effects sleep patterns, correlation between the lack of sleep and nurse fatigue - related to long shift hours worked	138 nurses on day/night shifts	Shift work does affect sleep patterns and Quality of Life, nurses feel fatigued, when working long shifts as well as consecutive shifts and it also affect their sleep patterns.

	Author, year, and country	*Type of study, duration, and intervention*	*Aim*	*Environment and sample*	*Results*
7.	Dong et al., 2017 China	Cross – sectional study (Pittsburgh Sleep Quality Index (PSQI) – 20 - minute test 8 months (May – December 2015)	Determine the prevalence of sleep disturbances among clinical nurses measuring Quality of Life	5.012 clinical nurses - female	Sleep disturbances are highly prevalent among clinical nurses in general hospitals in China (female gender, ICU and Emergency Department, many years of service, hight night shift frequency, professional status: primary and intermediate, employment status: temporary, poor Quality of Life: poor mental health, low perceived health, high occupational stress (high psychological demand, low job control, low workplace social support)
8.	Wickremaratne et al., 2017 Australia	Cross – sectional study 2 years (2006 – 2008)	Explore any association between colorectal cancer and rotating shift work in nurses and midwives	8.199 male and female nurses and midwives from Australia, New Zealand, and the United Kingdom	No significant association was found between rotating shift work and colorectal cancer in nurses and midwives
9.	Peplonska et al., 2017 Poland	Cross – sectional study Structured questionnaire 2 years (2008 – 2010) 1 year (2014 – 2015)	Rotating shift - work can be associated with the two tumours suppressors and DNA repair genes: BRCA1 and BRCA2	725 nurses and midwives (347 rotating night shifts, 363-day shifts, 40 – 60 years old)	No links between night shift work and BRCA1 and BRCA2 genes were observed. Smoking can contribute to epigenetic events

	Author, year, and country	Type of study, duration, and intervention	Aim	Environment and sample	Results
10.	Raskoden et al., 2017 Germany	7 days wearing multisensory accelerometer (Sense Wear BodyMedia armband) and detailed food diary, measures physical activity (METs), Quality of sleep assessed by Pittsburgh Sleeping Quality Index (PSQI), and stress load using Trier Inventory for Chronic Stress Questionnaire (TICS) 1 year (2013 – 2014)	Does working regular hours or rotating shift scan effect parameters of general health and nutrition (physical activity, sleep quality, metabolic activity, and stress levels)	46 volunteer participants of University Medical Department (23 rotating shifts, 21 non – shift regular hours)	Shift working had no influence on physical activity during working hours appears to be compensated for during off – hours. Nutritional status and stress level can effect on health – associated conditions
11.	Chang et al., 2017 Taiwan	Cross – sectional study 1 year (2011) Questionnaire	Investigate the relationships between burnout and three components (emotional exhaustion, depersonalisation, and reduced personal achievement) of nursing professional commitment	571 nurses	Burnout was related to components of nursing professional commitment

Discussion and conclusions

Nurses face many challenges during their professional work. During the encounter of suffering, the relief of problems, pain, encounters with death, sometimes on a daily basis, poor wages, poor work organization, during stress and anxiety, schedules and shift work also bring their consequences. Behrens et al. (2019) and Lieberman et al. (2020) find that shift work affects the concentration of nurses, they sleep less, are exhausted, it also affects the number of work errors, prolongs reaction time by performing consecutive shift work or night shifts, while Hayashi et al. (2020) argues that patient safety is related to the number of working hours, night shifts, and lack of nurses' days off. Nurses who work at night may not be able to provide a high standard of care due to the organization due to the negative effects of fatigue on the quality of care and safety, also say Antill et al. (2016). Dehring et al. (2018) say nurses working shifts are more prone to distress, anxiety, insomnia, depression, and social dysfunction, but the organizational climate and increase in supervisors could alleviate

this. Catterjee and Saha (2018) claim that nurses working in the intensive care unit have poorer quality of sleep, while Owens and Moultrie (2017) find that shift work affects sleep quality, sleep patterns, quality of life, exhaustion with fewer family and social activities. Also Dong et al. (2017) argue that poor working conditions and shift work affect sleep disorders and high levels of occupational stress due to high psychological stress, low control over one's own work and poor social support of the work environment, which is reflected in poorer mental health and poorer general health. Douglas (2014) and Lieberman et al. (2020) similarly find that we humans have a natural need to sleep about 8 hours a night and that shift work, especially at night, has a bad effect on health, family and social life and, due to lack of concentration, can affect safety when driving home or to work. Raskoden et al. (2017) say that shift work has no effect on physical activity but has influences on eating habits and higher levels of stress. Härter Griep et al. (2014) found that night work was associated with excess body weight and obesity and that nurses would need strategies for a healthy lifestyle at night as well as a regulated diet in the workplace. Chang et al. (2017) they say that burnout has a negative connection with affectivity and norms of professional affiliation which are depersonalization, emotional exhaustion, and reduced chances of achievement. Fujii et al. (2019) found that lower back pain was associated with some nurses working in certain wards. As shift work has the potential to adversely affect the health and safety of nurses, organizations should ensure appropriate schedules through leadership and good management, which is a major challenge and a burning issue. Douglas (2014), and Wickremaratne et al. (2017) found in their study that there was no significant association between colorectal cancer and shift work of nurses and midwives, Shi et al. (2020) and Lieberman et al. (2020), on the contrary, found in their research that the risk of cancer and colorectal cancer is higher for nurses who work night shifts, especially for those who do such work for a long time. Peplonska et al. (2017) notes that the study did not show an association between night shift work and tumor markers for breast and ovarian cancer. Trossman (2015) however, writes that in some states of America nurses are encouraged to go to rest or fall asleep briefly during night work, not to struggle with their circadian rhythm and not to disturb the biological clock, to be able to plan their own schedule, train attention, recognize fatigue, control sleep, and have education on balancing work and private life.

Organizations that employ nurses should, with good organization, careful scheduling, take care of the health of nurses, and at the same time take care to reduce errors for the benefit of patients. Nurses who take good care of their health, are aware of the risks of habits and take care of a healthy diet can be an example and good teachers to patients in the future. Many nurses perform shift work, including night shifts. Night shifts disturb the circadian rhythm of a person, which, with insufficient breaks and rest, leads to fatigue, overwork, burnout, bad mood, bad relationships at work, at home, and increases the risk of chronic diseases and even cancer. Night work is burdensome for nurses, the

longer they are exposed to it, the greater the risk to their health, professional attitude, the increased possibility of mistakes, and at the same time they work in a stressful environment where they have no support, sometimes social work relationships are broken. The health and satisfaction of nurses affects the work and the organization where they are employed.

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Use of mobile technology in healthcare

Grega Martin Glas, Sara Hafner, Špela Rozman, Andrej Starc
University of Ljubljana, Faculty of Health Sciences, Zdravstvena pot 5, 1000 Ljubljana, Slovenia
hafner.sara@gmail.com

Abstract

Introduction: It has been shown that ICT (Information Communication Technology) has the potential to provide better healthcare services. In the last decade, mobile technology has become very sophisticated and widely spread among people. It provides a new set of tools to improve the health professional-patient relationship. There have been developed many mobile applications that may be potentially useful for healthcare purposes. The literature review is aimed to present the role of mobile technology in healthcare. *Methods*: A descriptive research method with a critical review of English scientific and professional literature was performed, using Science Direct, CINAHL with Full Text, MEDLINE, and Google scholar. The keywords with the use of Bool›s operators AND/OR were: smartphones, mobile technology, and healthcare. Literature inclusion criteria were articles published between 2014 and 2019, freely accessible and primarily reviewed articles with clearly defined objectives and methods in the English language. We reviewed 15 articles, the excluded ones did not match our inclusion criteria. The literature search took place in February and March 2020. Data were analyzed using the content analysis method. *Results*: The results showed that mobile technology can benefit patients as well as healthcare professionals. Patients can use them as devices that help to perform daily tasks for a healthier life or easier management of chronic diseases. Mobile technology can empower the patients, so they can take control of their health condition. Healthcare professionals can use it for additional or different learning options or as a tool in patient-centered care. The use of mobile technology can influence communication and relationship between patients and healthcare professionals, also, it breaks down barriers, such as language and long-distance. Adopting mobile health technology perceived an overall positive impact among patients, indicating they are ready to transition from traditional clinical

encounters to modern treatment ways. Nevertheless, caution and professional perspective based on knowledge and ethical considerations are needed when implementing new technology in healthcare. *Discussion and conclusions*: The use of mobile technology and mobile health interventions has increased significantly. Even though mobile phone-based interventions have the potential to improve treatment outcomes, there are still challenges relating to new technologies that must be taken into consideration. To be able to understand how different factors affect the development process from a technical and human perspective there is a need for evaluation of mobile technology. It is necessary to conduct more studies with greater variety in research design and users on mobile applications to evaluate their effectiveness.

Keywords: smartphones, mobile technology, ICT, healthcare

Introduction

Within the last two decades, we have witnessed remarkable technological development of information and communication technologies and their implementation into healthcare (Cannon, 2018). Technological progress has resulted in several movements: a need to address the rising burden of chronic diseases, an exponential increase in developing smaller and cheaper devices, and developing a patient-centered healthcare model. Miniaturization of diagnostic instruments have led to promises to improve patient care, individual well-being, healthcare outcomes, encourage healthy behaviors, reduce healthcare costs and provide widely accessible services (Philips and Merril, 2015; Bhavnani et al., 2016; Aceto et al., 2018).

Mobile health (mHealth) is defined by the practice of medicine that is supported by portable diagnostic services. While technological development offers many benefits, it also raises many ethically relevant questions, regarding widespread device use and their safety (Bhavnani et al., 2016; Lucivero and Jongsma, 2018).

This literature review aims to present the role of mobile technology in healthcare.

Methods

A descriptive research method with a critical review of English scientific and professional literature was performed, using Science Direct, CINAHL with Full Text, MEDLINE, and Google scholar. The keywords with the use of Bool's operators AND/OR were: smartphones, mobile technology, and healthcare. Literature inclusion criteria were articles published between 2014 and 2019, freely accessible and primarily reviewed articles with clearly defined objectives and methods in English language. We reviewed 15 articles, the excluded ones did not match our inclusion criteria. The literature search

took place in February and March 2020. Data were analyzed using the content analysis method.

Results

Through applying our inclusion criteria we were able to find five articles on the use of mobile technology in healthcare. All of the studies are based on a literature review (table 1).

Table 1: Overview of the review studies

Authors and year of publication	*Purpose of research*	*Methodology*	*Results*
Quadah and Leutsch, 2019	To explore the influence of mHealth applications	A systematic, narrative review of literature	mHealth provides bidirectional communication, regular contact, and continuous care. It enables placing the patient at the center of discussion.
Grekin et al., 2019	To consider mHealth interventions	Literature review and viewpoint	mHealth reduces barriers, associated with cost, transportation, and treatment-related stigma.
Hallberg et al., 2020	To describe the development and evaluation of mHealth	Literature review	Evaluation on how various factors affect the development process from both a technical and human perspective is important.
Nouri et al., 2018	To assess the quality of mHealth apps	Literature review	Assessment criteria for devices evaluation: design, information/content, usability, functionality, ethical issues, security and privacy and user-perceived value.
Lucivero and Jongsma, 2018	To overview bioethical issues raised by mHealth	Literature review	Developers of the devices need to ensure that they will be used only for the intended purpose, in certain contexts.
Birkhoff and Smeltzer, 2017	To describe the experiences of mHealth applications among chronic disease populations	Integrative review of the literature	User-centered mHealth provides individualized support to chronic illness populations.

Discussion

The problem of the doctor-patient relationship in the form of depersonalization arises due to the absence of face-to-face interaction, nonverbal communication, and the opportunity to observe the patient (Quadah and Leutsch, 2019). Patients are burdened with professional tasks they are not qualified for (Lucivero and Jongsma, 2015; Cvirkel, 2018).

Mobile technology has the potential to provide services to areas and people that are difficult to reach. Those kinds of services may not reach the ones

who are most in need of care, due to lack of mobile phones, internet connection, low-income, and elderly people (Chib et al., 2014; Lucivero and Jongsma, 2015).

New revolutionary devices need to be assessed carefully concerning their plausibility (Lucivero and Jongsma, 2015). There are still many uncertainties, including the selection of appropriate devices, privacy and security issues, the lack of evaluation standards, limited quality control, and the pressure to move into the mainstream of healthcare (Noouri et al., 2018). Possibilities for abuse of sensitive health information and unforeseen effects need to be explored (Lucivero and Jongsma, 2015).

Conclusions

In the next decade, we expect even greater convergence of technology and healthcare, resulting in the development of new technologies. To achieve the potential of mobile technology in healthcare, we have to identify methods for patient engagement, to develop the necessary tools to streamline clinical integration and data analytics, and to outline the regulatory factors. There is a need to evaluate which patients are suitable for device-based self-care. Mobile technology is argued to be an efficient and cost-effective solution for prevention, monitoring, and management. Technical and ethical concerns arise, which demands structured verification and evaluation of mobile technology and the clinical impact of these technologies, due to overly positive promises.

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Musculoskeletal disorders among preschool teachers

Jera Gregorc, Mira Dolenc

University of Ljubljana, Faculty of Education, Kardeljeva ploščad 16, 1000 Ljubljana, Slovenia
jera.gregorc@pef.uni-lj.si

Abstract

Introduction: The profession of pre-school teacher (PST) is physically and mentally demanding and thus poses a risk to musculoskeletal disorders. The purpose of the study is therefore to determine how often musculoskeletal disorders occur among PST, which parts of the body are most affected, and to analyze whether there is a connection between pain perception and the risk factors. *Methods:* The research has included 155 PST from different kindergartens in the Central Slovenian region, who have answered questions from the reconstructed Cornell Musculoskeletal Discomfort Questionnaires CMDQ (German version: Kreuzfeld et al., 2016). The questionnaire was divided into 3 sections. The first part covered demographic questions, the second questions about stress and frequency and intensity of motor/sport activities, and the third part was a self-evaluation assessment of muscle and joint pain. Data were processed with the statistical package SPSS - 22.0. Descriptive and inferential statistics were used (Hi-square test of equal probabilities, t-test for independent samples, and bivariate correlation analysis). *Results:* We found out that more than half of PST detect musculoskeletal disorders, most commonly in the lower back (52%). PST more frequently and intensely perceive problems in the neck, shoulders and upper and lower back than in the arms or knees. We also found that those PST who evaluate their work more stressfully have more problems with muscle and joint pain. Among the most problematic pain-relieving activities, PST emphasized leaning, lifting of children, sitting on children's chairs and squatting. *Discussion and conclusions*: Based on the data obtained, we believe it would be reasonable to offer PST of biomechanics education and training and the use of proper load-lifting techniques, to make ergonomic adjustments in the playroom, and to carry out shorter work-appropriate exercise programs.

Keywords: musculoskeletal disorders, preschool teacher, risk factors

Introduction

The term musculoskeletal disorders (MSDs) refers to any discomfort, problem, or pain in the musculoskeletal system (Korhan and Memon, 2019). Joint and back pain are the most commonly self-reported impairments to health among the population of Slovenia and other developed parts of the world (NIJZ, 2014). The prevalence of lifelong back pain is 70 to 80 percent, and the prevalence is 25 to 45 percent in one year. At any given time, 15 to 20 percent of people experience back pain (Vengust, 2014). According to the World Health Organization, as many as 20% to 30% of people in the world live with muscle and joint pain, with lower back pain predominating (WHO, 2019).

Risk factors for the emergence of MSDs are different and can act alone or in combination (Voglar and Šarabon, 2014). We roughly divide them into three groups (Voglar and Šarabon, 2014; Zamri et al., 2017; Jaafar and Rahman, 2017): *personality*, *psychosocial*, and *physical*. Given that the nature of the educator's work is intertwined with all three groups of risk factors, it is possible to conclude that educators often have MSDs. *Physical risk factors* are most commonly associated with back pain due to the lifting and carrying children as well as moving furniture and sports equipment (Doan et al., 2017). *Psychosocial risk factors* are associated with educators' occupations due to time pressures, meeting children's needs, coping with conflict situations, working with children's parents, and maintaining positive interpersonal relationships during the simultaneous employment of an educator and an assistant (Ng et al., 2019). Working with children requires responsibility, a lot of energy, attention, alertness, sensitivity, and empathy, and so both stress and burnout occur among educators (Sottimano et al., 2018). However, *personality risk factors* do not represent significantly different adjustments and treatments as in other occupations.

Frequency indices, which show the number of cases of absence from work due to diseases of the musculoskeletal system and connective tissue, were slightly lower in the education sector until 2013 compared to all other business activities, and from 2014 up to and including 2018, they exceeded the values applying to all employees in Slovenia (National Institute of Public Health, 2019). In a systematic review of the literature, Erick and Smith (2011) found that the prevalence rate of MSDs among teachers and educators ranges between 40% and 95%. Among the most endangered body segments are injuries to the back, neck, and upper extremities.

Due to the prevalence of MSDs and growing problems in the education sector, and due to the simultaneous and intertwined risk factors for the development of MSDs among educators in this study, we wanted to find out how often and how intensely educators feel pain in muscles and joints, which parts of the body are most often affected and what the connection is of perceived pain with various risk factors.

Methods

A sample of respondents

The sample of respondents was non-specific. The study involved 155 educators of pre-school children from various kindergartens in Slovenia, who responded to the invitation to participate. Among them, 95.5% were women, and 4.5% were men. The breakdown of the age of the respondents was as follows: 26.5% of the surveyed educators were aged between 20 and 30, 34.8% were between 31 and 40, and 38.7% were aged 41 and over. 51.6% of the surveyed educators had been working from 0 to 10 years, 28.4% from 11 to 20 years, 8.4% from 21 to 30 years, and 11.6% from 31 to 40 years. More than half of the respondents, or rather 62.6%, worked in the second age group last year, while 37.4% worked in the first age group.

A sample of variables

The sample of variables represents a combination of three sets of questions. We compiled the first two sets ourselves, while the third represents a reconstruction of the CMDQ questionnaire (Cornell Musculoskeletal Discomfort Questionnaires) (German version: Kreuzfeld et al., 2016). The first part contained demographic variables (gender, age, job, the total number of years in education, the age group in which they were employed in the last year), the second part contained questions about the assessment of job satisfaction, feelings of stress and physical activities, while the third part covered questions on the assessment of musculoskeletal disorders (perceptions of pain in individual parts of the body, and the activities in which pain is felt as well as the patient's sick leave).

The organization and process of data collection

The survey questionnaire was sent by post in-line with prior arrangements with the kindergartens' management. The educators participated in the research anonymously and voluntarily. In the end, the completed questionnaires were collected, and the data was entered into a computer. The entire process of data collection and processing took place anonymously.

Methods of data processing

The collected data was processed with the IBM SPSS Statistics 25 software package (Statistical Package for The Social Science). Descriptive statistics (averages, standard deviations, asymmetry and flatness coefficients, minima, maxima) and inference statistics (Hi-square test of equal probabilities, t-test for independent samples, as well as bivariate correlation analysis) were used for processing.

Results

We will first present the frequency and intensity of MSD educators in our sample. Then a set of questions about satisfaction, fatigue, and stress at work as well as a set about the physical activity of educators. Finally, we will show the connection between them.

The frequency and intensity of MSD among educators

Table 1: A self-assessment of the frequency and intensity of MSD pain in different parts of the body among educators.

	Frequency				*Intensity*			
	Average	*No. of deviations*	*T-test for one sample (t = 3.22)*		*Average*	*No. of deviations*	*T-test for one sample (t = 3.01)*	
	($\bar{x}$)	*(σ)*	*t*	*p*	*($\bar{x}$)*	*(σ)*	*t*	*p*
neck	2.65	1.365	-5.18	0.00	2.54	1.31	-4.36	0.00
shoulders	2.67	1.395	-4.90	0.00	2.50	1.23	-5.01	0.00
the upper part of the back	2.79	1.332	-3.98	0.00	2.55	1.21	-4.65	0.00
the lower part of the back	3.23	1.219	+0.07	0.94	3.01	1.25	+0.03	0.98
knees	2.02	1.189	-12.48	0.00	1.98	1.18	-10.61	0.00
hands	1.93	1.193	-13.39	0.00	1.90	1.15	-11.79	0.00

Legend: $\bar{x}$ - average value on a five-point scale, σ - standard deviation, t - t-test value; p - statistical insignificance ($p \leq 0.05$)

Educators assessed the frequency and intensity of pain in each part of the body on a five-point scale. Table 1 shows that, on average, in the last year, they experienced the lowest frequency and intensity of knee and arm pain, followed by neck and shoulder pain. Both the frequency and intensity of pain is greatest in the upper and lower back. The frequency and intensity of pain are statistically and significantly different from the average in all parts of the body except the lower back, which means that educators statistically and typically most often and most intensely feel pain and discomfort in the lower back.

Satisfaction, fatigue, and stress

Educators were then asked about satisfaction, fatigue, and stress in the workplace. We found that the vast majority are satisfied, or rather 94.9% of educators are very satisfied or satisfied with their work. The average value on the 5-point satisfaction scale is 4.46, with a standard deviation of 0.65. An analysis of the questions related to fatigue shows that 63.8% of educators are often and occasionally tired at work, while 29% are rarely tired. The average value on the 5-degree fatigue scale is 3.12, with a standard deviation of 0.93. The analysis of questions about stress shows that 44.5% of educators experience the work of an

educator as moderately stressful, 29.7% quite stressful, 16.1% slightly stressful, and 8.4% very stressful. 1.3% of educators do not experience work as stressful.

Physical activity

Analysis of the data shows that 58.0% of educators are often or very often physically active, while 41.9% are occasionally, rarely, or never physically active. In 51.0% of the respondents, the intensity of exercise is medium, in 31.3% it is high or very high, while in 18.7% it is low or very low. From the data analysis, we can also determine the assessment of the frequency and intensity of the physical activity of the educators, namely on a 5-point scale where the frequency is estimated with $x = 3.70$ ($\sigma = 0.90$) and the intensity $\bar{x} = 3.13$ $\sigma = 0.84$).

Analysis of the relationship between the frequency and intensity of MSD with selected risk factors

We discovered an association between the assessment of the experience of stress and the frequency of pain perceived in different parts of the body. We found that there was a statistically significant, weak positive association (at a characteristic level of $p < 0.01$) between the assessment of workplace stress and the frequency of perceived problems or discomfort in the neck ($r_x = 0.272$), in the shoulders ($r_x = 0.301$), in the upper back ($r_x = 0.312$), in the lower back ($r_x = 0.289$), in the knees ($r_x = 0.324$) and in the arms ($r_x = 0.354$). With an increase in the feeling of experiencing stress, the perception of problems in the neck, shoulders, upper and lower back, knees, and arms are also statistically significantly more frequent. Relationships between physical activity and intensity or rather the frequency of pain was not confirmed. Analysis of t-test results for dependent samples ($t = 1.839$, $p = 0.068$) also did not reveal differences in the intensity and frequency of pain between educators of the first and second age groups.

Discussion

In the research, we wanted to analyse the frequency and the degree of intensity of pain in individual parts of the body and to determine a possible connection between these and the experience of stress, physical activity, and the age of children where the educators are employed.

Based on their own self-assessment, educators evaluated the frequency and intensity of pain they perceived in individual parts of the body over the past twelve months. 91.6% of educators noticed pain in the lower back, 76.8% in the upper back, 75.5% in the neck, 74.2% in the shoulders, 53.5% in the knees, and 48.4% in the arms. Compared to other studies (Ng et al., 2019; Converso et al., 2018; Koch et al., 2015), educators in our study expressed similar or more frequent, but more intense pain. Converso et al. (2018) found that when working with children, educators most often experience pain in the upper back (84%), followed by the neck (75.6%), lower back (56.3%), shoulders (49.6%) and

the knees (38.7%). Sottimano et al. (2018) pointed out that 63.3% of educators have cervical pain and 67.5% lumbosacral pain. Koch et al. (2015) found aut that 40% of educators have lower back pain, followed by neck and shoulder pain. Pirbalouti et al. (2017) found that 30.5% of educators have pain in the lower back and slightly less in the neck and shoulders. With additional analysis, we found in our sample of educators that the frequency and intensity of lower back pain were statistically and significantly predominant over other parts of the body. Although the causes of pain cannot be found exclusively in the work environment, as they are also influenced by personality and other risk factors, work in kindergarten still involves quite a few psychosocial (Sottimano et al., 2018; Converso et al., 2018) and physical (Mayer et al., 2012) risk factors. An analysis of our survey data showed that as many as 67.6% of educators believe that lower back pain is related to their work, and a good half (52.3%) believe that the work environment is the cause of upper back pain. Regarding pain in the neck, shoulders, arms, and knees, however, most educators believe that the cause of them does not come from the work they do.

In the second part, we determined the level of satisfaction, fatigue, and experience of stress at work. All three factors are classified as psychosocial risk factors for MSD (Hauke et al., 2011). The results of the survey showed that as many as 94.9% of educators are satisfied or very satisfied at work, so we believe that the factor of satisfaction at work could not be defined as one of the risk factors for MSD among educators. On the other hand, as many as 70.3% of educators are occasionally, often, or very often tired at work. Fatigue is shown in a decrease in efficiency and functionality and in a decrease in work motivation and an increased feeling of being overloaded. Fatigue can disrupt the functioning of biological functions and the mental state of the personality (Balantič et al., 2016). Therefore, fatigue can also contribute to a greater psychological burden on employees.

In the third part, we determined the frequency and intensity of the physical activity of educators. Various studies emphasize the importance of physical exercise and its preventive and curative impact on MSD (Chatzitheodorou et al., 2007; Erick and Smith, 2013; Kim et al., 2015; Rošker et al., 2014; Voglar and Šarabon, 2014). We found that 58.0% of educators are often or very often physically active, and 41.9% are occasionally, rarely, or never physically active.

In the last part, we examined the possible connections between selected risk factors (physical inactivity, stress, fatigue, type of work) with the frequency and intensity of MSD. We found a weak positive association between the experience of stress and the frequency and intensity of pain in some parts of the body. We were unable to confirm a negative or positive association between physical activity and the frequency and intensity of pain. We also failed to confirm a connection with the type of work or rather the age group of children. Given the nature of work in the first age group, which frequently involves lifting children to changing tables, highchairs, cribs, and generally more assistance in meeting children's basic needs, we expected educators working in the

first age group to have more problems with muscle and bone pain. Converso et al. (2015), who examined differences between first and second age educators in psychophysical health, found that first age educators are more likely to complain about milder forms of MSDs.

Conclusions

A synthesis of the results directs us to consider the reasons for an increase in the presence of MSD among educators. Further research and comparisons in relation to the rise of MSDs in comparable occupations are necessary. It would make sense to research what is known about preventive measures and their degree of compliance.

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Ensuring Safe Food Preparation among Slovenian Consumers

Mojca Jevšnik[1], Lucija Pirc[1], Peter Raspor[2], Karmen Godič Torkar[1]

[1]University of Ljubljana, Faculty of Health Sciences, Zdravstvena pot 5, 1000 Ljubljana, Slovenia

[2]Retired Professor

mojca.jevsnik@zf.uni-lj.si; pirc.lucija@gmail.com; karmen.torkar@zf.uni-lj.si; peter.raspor@guest.arnes.si

Abstract

Introduction: According to EFSA, most foodborne diseases still develop at home. Consumers have insufficient knowledge of food safety and fail to transfer it properly into daily practice. The purpose of the research is to identify consumers' food safety knowledge and attitudes, their handling of selected foods and the hygiene in the kitchen. *Methods:* The mixed method approach was used. The knowledge of 380 consumers was examined with a survey questionnaire. In the second part of the study we observed 16 consumers during their preparation of specific foods, using an observation checklist. Eight consumers were older than 65, while eight were younger than 35 with small children. The hygiene conditions in the consumers' kitchens were examined using contact agar plates for determination of the number of different groups of microorgansims, while the cleaning adequacy was determined by measuring the ATP bioluminescence. *Results*: A lack of knowledge on certain topics regarding food safety was established; the consumers aged 36 to 55 and women demonstrated the highest level of knowledge. In some cases, the consumers who were being observed did not take proper action when preparing the food and therefore increased the risk of the cross-contamination of foods, food contact surfaces and kitchen utensils. Most consumers believe that they prepare foods according to food safely requirements. The increased number of total bacterial count, coliform bacteria and the *Escherichia coli* bacteria was detected in only 12.75% of consumers' kitchens observed. The results of ATP measurements showed that more than half of the samples of surfaces were not cleaned satisfactorily. *Discussion and conclusions*: Greatest emphasis has to be put on the cleaning of home kitchens. Even though consumers have some knowledge on food safety (e.g. preventing cross-contamination, storing leftovers, using separate kitchen towels), they often fail to put that knowledge into practice. Consumers should pay more attention to personal hygiene, especially to washing their hands more often and more thoroughly.

They should clean surfaces for food preparation, utensils, cutlery and dishes in their kitchens more thoroughly and promptly. They should pay more attention to preventing cross-contamination from surfaces that come into contact with food.

Keywords: Consumers, Food safety, Hygiene, Knowledge

Introduction

An integrated approach is essential for food safety, as it takes into account the fact that food supply is linked to the food supply chain from farm to fork. Consumers also play an important role in ensuring food safety, as they represent the final link in this food supply chain (Jevšnik et al., 2008). Among all reported cases of foodborne infections and poisonings in the European Union, the European Food Safety Authority (EFSA, 2018) in its annual report highlighted inadequate heat treatment of food as the main known cause of disease in households. The second most common cause was an inadequate food storage temperature. As an important cause of infections and food poisoning, they also pointed out food hygiene, which includes cleaning, washing and handling of food during its preparation.

Many consumers are unaware of the fact that also their home environment poses a risk of foodborne disease outbreaks (Byrd-Brebenner et al., 2013). Research findings show that consumers most often associate foodborne disease with the catering industry or food establishments (Jevšnik et al., 2013). Most of the food is prepared by consumers at home (Byrd-Brebenner et al., 2013), so knowledge about food preparation in their home kitchen is all the more important, as it reduces the likelihood of foodborne diseases (Meysenburg et al., 2014). Proper consumer behaviour in food preparation is, in addition to the knowledge of food hygiene, a key element in ensuring consumer safety (Ovca et al., 2014; Jevšnik et al., 2013; Kendall et al., 2013). The lack of knowledge and mishandling of food during preparation is more common in consumer groups of young adults (18 to 29 years), men, and people older than 60 years (Jevšnik et al., 2008; Leal et al., 2017). In studies that gathered data through questionnaires and by observing consumers during food preparation, it was observed that many consumers correctly answered questions about food safety and good hygiene practice. However, the results of observing consumers during food preparation show that they often act contrary to what they state in the questionnaires (Tomaszewska et al., 2017; Mazengia et al., 2015; Sampers et al., 2012; Clayton & Griffith, 2004), the chances of foodborne infections are thus much higher than shown in epidemiological data (Lange et al., 2016; Byrd-Brebenner et al., 2013; Kendall et al., 2013). Irregularities in food handling at home are related to improper hand washing, improper separation of equipment and utensils, inadequate food storage, cross-contamination and insufficient heat treatment of food (Odeyemi et al., 2019; Gong et al., 2016; Burke et al., 2016; Bearth et al., 2014; Ergonul, 2013; Jevšnik et al., 2008). The purpose of our research was

to determine the knowledge of consumers about providing safe food, their behaviour during the preparation of selected foods and the hygienic conditions in home kitchens. Due to the scope of the research, the paper presents only the results of a questionnaire on consumer knowledge of food safety.

Methods

Consumer surveys on ensuring safe food preparation

To test consumers' knowledge of food safety, we used a validated questionnaire, mostly based on a questionnaire from the Food and Drug Administration (2010). Additional questions were added in order to compare the data with the previous Slovenian survey on consumer knowledge of food safety from 2008 (Jevšnik et al., 2008).

The questionnaire was entered into the 1KA online survey application and a web link to the survey questionnaire was sent to consumers via e-mail and social networks. A t-test for independent samples with the significance level of $p < 0,05$ was used for the statistical analysis of the obtained data.

Results

Due to the scope of the research, the paper presents only the results regarding consumer knowledge in the field of food safety. The online survey was started in November 2018 and completed in April 2019. Only relevant units that were fully (n = 260) or partially completed (n = 80), a total of 340 survey, were used for the analysis of the questionnaire. The largest number of respondents who completed the questionnaire was from the first age group (n=171, 50%), followed by respondents from the second age group (n = 107, 31 %) and from the third age group (n=62, 19 %) (Table 1).

Demographic data

Table 1 shows the demographic data of the surveyed consumers, i.e. age groups, level of education and gender.

Table 1. Demographic data of surveyed consumers (n = 340)

Survey questionnaire	*n*	*%*
Age groups		
1st age group (18 to 35 years)	171	50
2nd age group (36 to 55 years)	107	31
3rd age group (over 56 years)	62	19
Level of education		
Primary, secondary and higher education	185	55
University education, master's degree, doctorate	155	45
Gender		
Men	63	19
Women	277	81

Results of the questionnaire

Important results of the questionnaire are presented separately according to content areas.

We begin by establishing that more than half of the respondents (65 %) believe that foodborne diseases are rare in domestic households. 62 % of respondents believe that people more often get infected and/or poisoned by food consumed in restaurants.

Washing hands

The questionnaire found that 60 % of consumers always wash their hands before preparing food, while the rest almost always (31 %) or sometimes (9 %) wash their hands. Statistically significant differences in hand washing were found between the age groups of respondents, as half of consumers from the 1st age group and almost two thirds from the 2nd and 3rd age groups always wash their hands ($p = 0.024$, $r = -0.111$) (Figure 1).

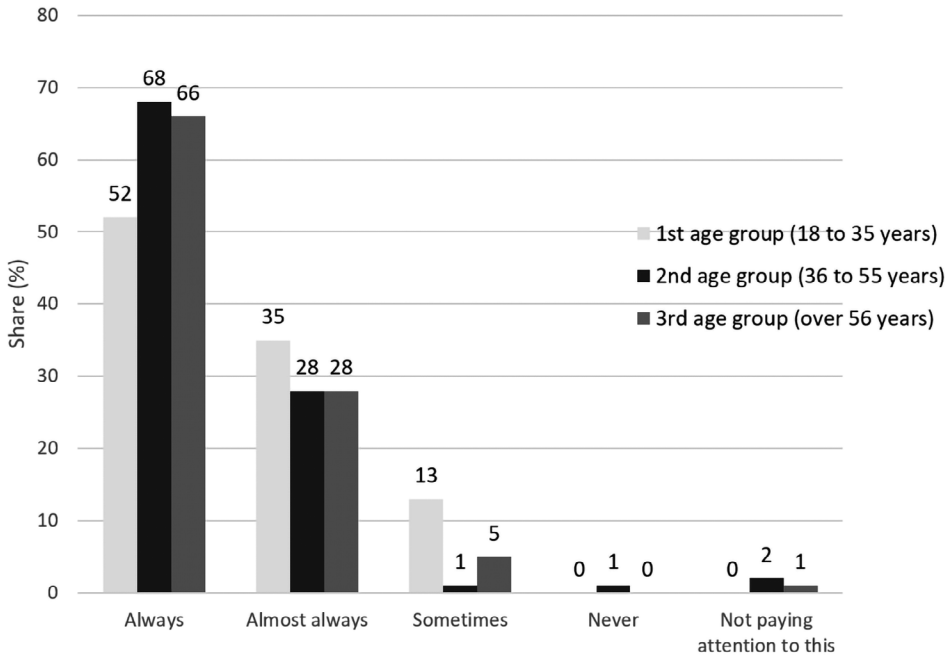

Figure 1: Shares (%) of respondents' answers regarding hand washing before food preparation by age groups (n = 290).

Among the 290 respondents, 26 % wash their hands for 10 seconds or less, 46 % for 11 to 20 seconds, 10 % for 20 seconds or more, while the others pay no attention to the washing time. Significantly, more men (43 %) than women (23 %) wash their hands for only 10 seconds or less, while a higher proportion of women (20 %) than men (6 %) do not pay attention to the time of wash-

ing hands. It is statistically proven that women wash their hands longer than men ($p = 0.008$).

After washing their hands, 37 % of the respondents use a kitchen towel to wipe their hands, followed by those who use paper towels (26 %) and those who use a kitchen towel that is also used to dry the dishes (22 %). Statistically significant differences were observed between age groups ($p = 0.042$, $r = 0.125$) and levels of education ($p = 0.006$, $r = 0.107$). Improper wiping of hands with a kitchen towel that is used for the dishes is the most common with consumers from the 1st age group (29%) and those with a university degree, master's degree or doctorate (27 %). Paper towels are most often used by consumers from the 3rd age group (34 %) and those with completed primary, secondary or higher education.

Washing food cutting board after use

Half of consumers in the 2nd age group (51 %) use a second vegetable cutting board after cutting red meat or poultry. A second cutting board is used by 44 % of respondents in the 1st age group and only 33 % of respondents in the 3rd age group of over 56 year olds ($p = 0.027$, $r = -0.103$). After use, 44 % of the respondents wash the board with detergent and warm water (38% of all women and 27% of men surveyed), and 17 % of respondents wash it only with water, more men (29 %) than women (11%) ($p < 0.001$, $r = -0.220$) and most of the consumers from the 3rd age group (23 %).

Knowledge of appropriate temperatures

About a third (30 %) of surveyed consumers have a thermometer in their home refrigerator to measure its temperature. 51 % of the respondents do not know the temperatures in their refrigerators. Among those who state that they have a thermometer, just over a half of them (54 %) know the temperatures. As many as 40 % of the respondents never check the temperature, or they only check it when the food is too warm or too cold to the touch (32 %), the rest check the temperature daily, once a month or weekly (28 %). The respondents were asked to indicate the temperature in their home refrigerator. The mean value of the temperatures reported was 5.4 °C, the highest 18°C and lowest -20°C. Most consumers (31 %) stated that the temperature was 5 °C. Respondents clean refrigerators as needed (68 %), every month (22 %) or once a week (9 %).

Knowledge of microorganisms found in home kitchens

The best knowledge of microorganisms was found in younger consumers from the 1st age group, and the least in respondents from the 3rd age group. The bacteria *Yersinia enterocolitica* (79 %), *Bacilus cereus* (75 %) and *Clostridium perfringens* (71 %), are the least known, while *Salmonella* (96 %), *Escherichia coli* O157 (56 %) and *Staphylococcus aureus* (40 %) are the best known. Consumers

with a university degree or more are best acquainted with the selected microorganisms.

Food thawing

Frozen meat is properly thawed by 52 % of respondents (34 % in the refrigerator, 11 % under running cold water and 7 % in the microwave oven). 42 % of respondents defrost meat on the kitchen counter, while 6 % of respondents never defrost frozen meat.

Food handling after heat treatment

50 % of respondents leave the prepared dish at room temperature for less than two hours to cool down, 28 % of them for more than two hours and 21 % pay no attention to it. The majority of consumers surveyed (88 %) handle roasted meat correctly, as after heat treatment they do not put it in the container in which the raw meat was stored.

Discussion

The aim of the research was to determine the knowledge of consumers about ensuring food safety. It was assumed that consumers with a higher level of education would have more knowledge in the field of food safety, but this cannot be fully confirmed, as it was found that there are only certain areas where consumers with a higher level of education (university education and more) show better knowledge than those with a lower level of education (primary, secondary or higher school). These areas are: knowledge of microorganisms that can cause food contamination, wiping hands after washing, and food defrosting procedures. The Food Safety Survey by the Food and Drug Administration (2010) found that food is handled the least safely by the youngest American consumers, by the oldest and by those with the highest level of education.

Proper hand washing before and during food preparation is done more consistently by female consumers than by male ones, as 62 % of women and 51 % of men always wash their hands before preparing food. If we compare the results with a previous study among Slovenian consumers conducted by Jevšnik and co-workers (2008), we see that the majority of consumers (86 %) always wash their hands before preparing food. Our present research came to poorer results, as only 60 % of all respondents always wash their hands before preparing food. In the study by Jevšnik et al. (2008), it was found that more than half of consumers wash their hands for less than 10 seconds, which is almost half more than in this recent study, where about a quarter report hand washing time of less than 10 seconds. 67 % of respondents wash their hands with soap and warm water after handling raw red meat, chicken or fish, which is more than in the study by Jevšnik et al., where that share was 57 %.

In our recent study, it was found that 30 % of the respondents have a thermometer in their home refrigerator to check the temperature. Better results are

shown in a survey of American consumers, where 42 % of respondents have a thermometer in the refrigerator, with an average temperature of 3.6 °C (Food and Drug Administration, 2010). The average temperature stated by the surveyed consumers in our study is slightly higher and amounts to 5.4 °C. Half of the respondents stated that they are not familiar with the temperatures in home refrigerators. 40 % of the respondents never check the temperature, followed by those who check the temperature when the food is too hot or too cold to the touch.

The questionnaire results show that slightly less than half of the respondents defrost food at room temperature, while the rest carry out the procedure correctly, in the refrigerator, under running cold water or in the microwave oven. Lower results were reported by Sterniša et al. (2018) and Jevšnik et al. (2008), where almost three quarters (73 %) or half (50 %) of respondents thawed frozen meat at room temperature. Studies from abroad found that meat is thawed at room temperature by 44 % of Nigerian consumers (Adebowale et al., 2017), 47 % of African and Asian consumers (Odeyemi et al., 2019) and 73 % of consulted Belgian consumers (Stratev et al., 2017), as well as more than half of Turkish consumers (Ergonul, 2013).

The best knowledge of microorganisms that can cause foodborne diseases is shown in consumers younger than 35 years, which can be attributed to the fact that they have greater access to information than older consumers. In general, the knowledge of pathogenic microorganisms is poor. More than half of the surveyed consumers know only two types of bacteria, namely *Salmonella* and *Escherichia coli* O157, which is more than noted by Gong et al. (2016), as more than half of Chinese consumers have never heard of these bacteria.

Conclusion

The study provided insight into consumer knowledge about how to ensure food safety when working with food at home. Deficiencies were found in the consumers' knowledge regarding food defrosting procedures, food hygiene, knowledge about pathogenic microorganisms in food, the use of thermometers in refrigerators and checking the core temperature of food during heat treatment. The highest level of knowledge was shown by consumers aged 36 to 55, in particularly female showed better performance. Respondents are largely convinced that foodborne infections occur primarily in restaurants, not at home. Statistics by the European Food Safety Authority show just the opposite. The largest share of infections occur at the end of the chain, on the consumers' side. It is therefore necessary to raise the awareness in all age groups of consumers and provide systemic education of children and adolescents about ensuring food safety during the purchase and in handling food at home.

Only in this way will young consumers become responsible and aware of the fact that they are the last link in the food safety chain, obliged to handle food safely and in accordance with producers' requirements.

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The role of information and communication technology in self-management of type 2 diabetes

Filip Krajnc, Maruša Magister, Klara Nartnik, Andrej Starc

University of Ljubljana, Faculty of Health Sciences, Zdravstvena pot 5, 1000 Ljubljana, Slovenia

krajncfilip@gmail.com, marusa.magister04@gmail.com, klaraaara@gmail.com, andrej.starc34@gmail.com

Abstract

Introduction: Type 2 diabetes is a chronic disease which represents a substantial burden on healthcare across the world. The use of information and communication technology (ICT) in self-management of diabetes is becoming more common, as it enables effective self-management and control over your health. Technology such as computers, smart phones, tablets and mobile apps can overcome time and location barriers by monitoring data such as blood glucose levels from home and can establish communication between patients and healthcare personnel. Previous studies have shown that despite numerous benefits, prevalence of ICT use in self-management of type 2 diabetes is low. *Methods:* The descriptive research method with a systematic literature review was used in the following databases: Google Schoolar, PubMed, CINAHL and Medline. The search proceeded with the help of Boolean logical operator AND, together with the key words: »Patient«, »Type 2 Diabetes«, »Self-management«, »Information and communication technology«. A systematic literature review was conducted in the first half of March 2020. PRISMA methodology was used to display decisions about usefulness of reviewed sources and seven of those sources were selected for further analysis. *Results*: Patients with type 2 diabetes are willing to use ICT and are aware of its benefits, but the prevalence remains low. Ignorance about computers, smart phones or more specifically mobile apps and the possibility of personal information breaches are the most common barriers to ICT use. Results show that the use of ICT contributes to a statistically significant reduction of glycated hemoglobin (HbA1c), however studies are divided about the reduction of body weight and body mass index (BMI). Patients want ICT to include different communication channels, enable possibilities for exchanging experiences and connection with different healthcare systems and to offer written and visual individualized information about their disease.

Discussion and conclusions: Because the use of ICT enables simpler monitoring of diabetes and reduces the possibilities of complications, its use is becoming ever more necessary, due to the fast ageing population and an increasing rate of chronic disease. This way of self-managing disease will simplify medical treatment for patients living in the countryside because of faster and easier access to medical assistance. In addition, healthcare personnel will be relieved of unnecessary treatment and will be able to take preventative measures faster and more easily through continuous patient monitoring. Developing new ICT for the management of chronic diseases such as type 2 diabetes requires collaboration between healthcare personnel and ICT experts; in addition, we must consider the patient's wishes and needs.

Keywords: patient, type 2 diabetes, self-management, information and communication technology

Introduction

Type 2 diabetes mellitus (T2DM) is a chronic disease that represents a major cause of morbidity and mortality and has a substantial burden on healthcare across the world (WHO – World Health Organization, 2018). In 2019 the prevalence of diabetes was estimated to be 9,3 % worldwide (463 million of people) and by 2030 they expect an increase to 10.9 % (700 million of people) (Saeedi et al., 2019). Improperly managed diabetes leads to serious damage to the heart, blood vessels, eyes, kidneys, nerves, and limb amputation (WHO, 2018). Active and efficient management of diabetes, which can be exceedingly difficult (Nyenwe et al., 2011), is key to prevent or minimize these complications (CDC – Centers for Disease Control and Prevention, 2019). Information and communication technology (ICT) is generally defined as technology used to communicate, manipulate, and store data by electronic means (Perron et al., 2010). The use of ICT is becoming more common, as it enables effective self-management of diabetes, patient empowerment, and control over your health (Yamaguchi et al., 2019). ICT such as computers, smart phones, tablets, and mobile apps can overcome time and location barriers by monitoring data such as blood glucose levels from home (Arnhold et al., 2014), establish communication between patients and healthcare personnel and help patients learn more about their ongoing self-care (Cui et al., 2016).

Methods

We conducted a systematic literature review with a descriptive analysis of the sources. The literature was searched in the following databases: Google Scholar, PubMed, CINAHL, and Medline. Keywords used to search for relevant articles included: "Patient", "Type 2 Diabetes", "Self-management", and "Information and Communication Technology". The search proceeded with the help of Boolean logical operator AND for connecting the search terms. English-language articles, published between 2015 and 2020 that were available in full,

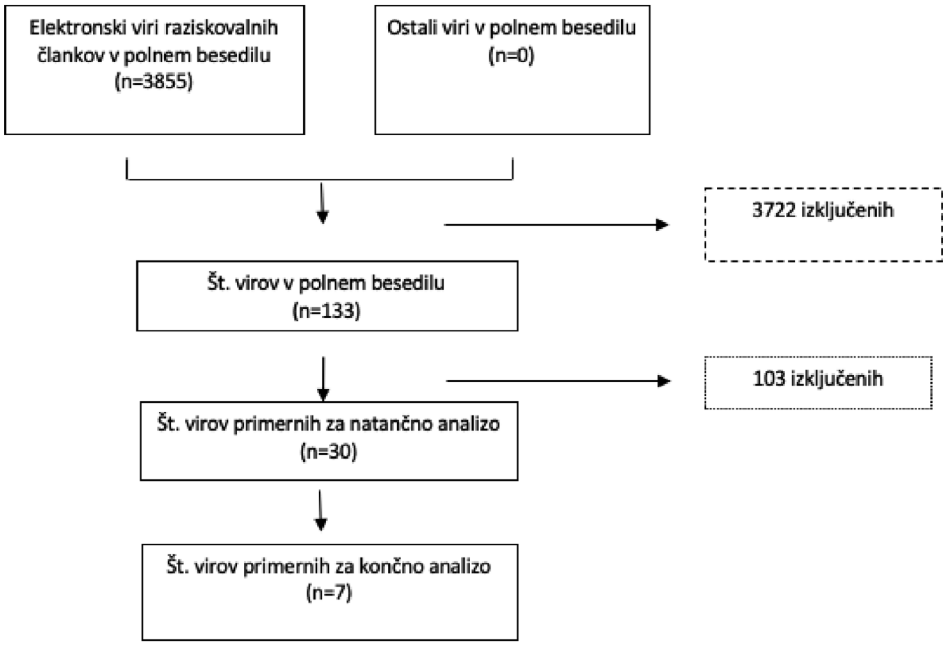

Figure 1: PRIZMA diagram

were identified and reviewed. PRISMA methodology (Figure 1) was used to display decisions about the usefulness of reviewed sources.

Results

Results of a descriptive analysis of the studies are presented in Table 1.

Table 1: Overview of studies

Author	*Purpose of research*	*Methodology*	*Results*
Aminuddin et al., 2019	To determine the effectiveness of smartphone-based interventions.	A systematic review and meta-analysis.	Participants who received smartphone-based self-management intervention had better self-efficacy, self-care activities, health related quality of life and lower glycated haemoglobin compared to the control group. The effects on body mass index and blood pressure were not statistically significant.

Author	Purpose of research	Methodology	Results
Ayanlade et al., 2019	To identify the ICT tools used for diabetes management and assesses the level of adoption of the tools.	Questionnaire, observation, and structured interviews.	ICT reduce health care personnel's workload and enable faster and easier completion of their daily tasks. Patients acknowledge the usefulness of ICT because it helps with their disease management plans.
Gardsten et al., 2017	To identify patients' wishes and needs for an ICT self-management service.	Participatory design: Future workshop method.	ICT self-management service needs to offer different communication channels, possibilities for exchanging experiences and written and visualized individualized information.
Georgsson and Staggers, 2017	To understand patients' perceptions of using ICT for diabetes self-management.	Descriptive study using a questionnaire and semi-structured interview.	Patients had positive perceptions toward ICT tool. After 6 months of using the ICT tool they saw clear benefits in using the technology and had favourable behavioural disease outcomes.
Lehocki et al., 2015	To evaluate impact of ICT on clinical outcomes (glycated haemoglobin (HbA1c) and metabolic parameters).	Prospective, non-interventional, observational, multicentre study.	Clinical evaluation after 3 months of intervention showed statistically significant change of HbA1c in both patient groups. Results also showed statistically significant tendency to decrease in weight and BMI.
Petersen et al., 2018	To identify the challenges and barriers for the adoption of ICT tools for diabetes self-management.	Qualitative study with semi structured interviews.	Barriers to ICT adoption for diabetes self-management are: expensive ICTs, lack of technological literacy, participants' perceptions that mobile technologies are useless, the mistrust of technology and the preference for face-to-face interaction with medical staff.
Shibuta et al., 2017	To examine the prevalence and patient characteristics associated with willingness to use ICT in self-management of diabetes.	A cross-sectional interview survey.	Only 16 % patients with diabetes currently use ICT and a total of 50 % expressed the willingness to use ICT in future. Factors associated with the willingness are not having nephropathy, outpatient visits once a month or more, current use of personal computers and/or smartphones and having greater diabetes related emotional distress.

Discussion

Prevalence of patients using ICT-based self-management tools is low (16 %) (Shibuta et al., 2016). The most common tools they used were applications,

spreadsheet software and pedometer functions in mobile phones. On the other hand, most of the patients with type 2 diabetes were willing to use ICT-based tools in future and thought it is useful (Shibuta et al., 2016). In the study from Georgsson and Stagegers (2017) patients saw clear benefits in using the technology and had favourable behavioural disease outcomes after 6 months using ICT-based self-management tool. These types of tools were also accepted by the health care personnel, who claimed it helped them with continuous monitoring of the patient's health status, especially for patients that live in the countryside. It also helps take preventive measures sooner, relieve them unnecessary work and enables faster and easier accomplishment of their daily tasks (Ayanlade et al., 2019). Psychosocial factors which influence patients' willingness to use ICT are the patients' attitude toward ICT, the effectiveness and level of expected success of such technology, and the strive imported by the patients (Shibuta et al., 2016). Other factors associated with the willingness are not having nephropathy, frequent visits to diabetes physicians once a month or more and current use of personal computers and/or smartphones (Shibuta et al., 2016). Patients suggested that ICT should include different communication channels, enable possibilities for exchanging experiences and connection with different healthcare systems and to offer written and visual individualized information about their disease (Gardsten et al., 2017). Patients were unwilling to use an ICT based self-management tool because it seemed burdensome, difficult to use and too complex, especially for older patients. For some patients it seemed boring, ineffective, and too time consuming. Others thought that their current self-management activities were enough for them or their health condition did not allow them to use ICT based tools (Shibuta et al., 2016; Petersen et al., 2018). Other barriers included fear of data insecurity, mistrust of technology and the preference of face-to-face interaction with health care personnel (Petersen et al., 2018; Ayanlade et al., 2019). It was shown that patients found ICT based tools helpful in making diabetes self-managment plans (Ayanlade et al., 2019). They also used ICT to facilitate data logging and as an incentive for better adherence to disease management principles. Studies show that the use of ICT contributes to a statistically significant reduction of glycated haemoglobin (HbA1c) (Lehocki et al., 2015; Aminuddin et al., 2019). Patients that used ICT-based self-management tools also showed better self-efficacy, self-care activities and health related quality of life (Aminuddin et al., 2019). Studies are however divided about the reduction of body weight and BMI (Lehocki et al., 2015; Aminuddin et al., 2019).

Conclusion

Patients with diabetes are aware of ICT's benefits, importance, and usefulness in self-management, yet its usage remains low. ICT has a positive effect on both patients and health care personnel. It is a matter of fact that ICT is becoming more necessary, due to the fast ageing population and an increasing rate of chronic diseases. Therefore, it is important to know and understand the res-

ervations patients with diabetes have toward ICT, so they can be successfully eliminated. When developing new and improved ICT we must consider the patients' needs and wishes.

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Relationship between breathing exercises and quality of life in adults – integrative literature review

Eva Lenart[1], Karin Vrtar[1], Sabina Ličen[1], Milan Hosta[2], Matej Plevnik[1]

[1] University of Primorska, Faculty of Health Sciences, Polje 42, 6310 Izola, Slovenia
[2] TEDU Institute, Žabnica 82C, 1357 Notranje Gorice, Slovenia
ewa.lenart.l@gmail.com; karin.vrtar@gmail.com; sabina.licen@fvz.upr.si;
milan.hosta@spolint.org; matej.plevnik@fvz.upr.si

Abstract

Respiratory disorders are a common occurrence in adults, also occurring in people without medically diagnosed medical conditions. The most common is the hyperventilation syndrome, which is present in 6% to 10% of adults and has an impact on health. The purpose of our study was to review the literature on the association of breathing exercises with improving lung function and to assess the quality of life in adults. The research used an integrative review of the scientific literature. 7 relevant studies were identified. The results suggest a connection among breathing exercises, the quality of life and the improvement of lung function, as well as between breathing exercises and the decrease in the number of hyperventilation attacks, the improvement of lung capacity and the improvement of body component of the assessment of the quality of life and the decrease in ambulance visits. Breathing exercises in healthy adults are associated with the assessment of the quality of life and the improvement of lung function, as well as with the fact that this field is poorly researched.

Keywords: breathing, exercise, lifestyle, quality of life, breathing technique

Introduction

Breathing is a basic physiological function, the main task of which is to supply the body with oxygen and remove carbon dioxide. Breathing, however, changes all the time – it is related to our physical activities (McConnell, 2011), emotions (Gilbert, 2014; Jerath et al., 2015), well-being, as well as external stimuli, such as various odours or air pollution. We do not pay much attention to these risk factors until we notice symptoms that disrupt our breathing pattern. However, a broken respiratory pattern indicates a respiratory disorder. Respirato-

ry disorders are a common occurrence in adults and they also occur in people without medically diagnosed medical conditions (Hagman, Janson & Emtner, 2011). The most common is the hyperventilation syndrome, which is present in 6% to 10% of adults (Chaitow, Bradley & Gilbert, 2014). The overall respiratory capacity associated with the use of optimal breathing patterns also has an impact on health. The reasons are mainly exposure to stressful situations or unconscious fears that can cause anxiety, depression and stress (Jerath, 2015). These conditions are associated with excessive frequency and volume of respiration, which usually leads to hyperventilation (Chenivesse et al., 2013). On a psychological and physical level, such a condition can express itself as fatigue, dizziness, tingling, weakness, headache, and the like. These are the signs with which we can describe respiratory disorders (Chaitow et al., 2014). Since disorders are not necessarily always present and come in onset, the condition is difficult to recognize and diagnose, and is often confused with asthma (Hagman et al., 2011). Healthcare professionals have few information about these conditions, leading to a misunderstanding of the phenomenon and inappropriate action (Vidotto, Carvalho, Harvey & Jones, 2019). The purpose of our study was to review the literature on the association of breathing exercises with improving lung function and to assess the quality of life in adults.

Methods

The research used an integrative review of scientific literature, which was accessed in April 2020 via electronic databases PubMed, Google Scholar and Science Direct. The search string included the following keywords and their synonyms: respiration, performance, adults, quality of life, lifestyle. In all databases, we used an advanced search with the included Boolean operator AND / IN between two or more keywords. We took into account the inclusion criteria, namely the publication of papers between 2010 and 2020, the adult population between 18 and 65 years of age and the accessibility to the full text; and the exclusion criterion: a medically diagnosed medical condition.

Results

The results show a connection between breathing exercises and the general quality of life and health factors in adults without medically diagnosed medical conditions. We note a lack of research that would study breathing techniques and their impact on the improvement of lung function and research on the assessment of the quality of life in healthy adults without the presence of diagnosed diseases. Out of 52 items found, 7 relevant studies were identified. The results suggest a connection among breathing exercises, the quality of life and the improvement of lung function, as well among breathing exercises and the decrease in the number of hyperventilation attacks, the improvement of lung capacity and the improvement of body component of the assessment of the quality of life and the decrease in ambulance visits. The results also show that breathing techniques can be an alternative treatment for stress; anx-

iety, depression and some emotional problems, and that diaphragmatic breathing exercises can affect attention, the presence of outburst events and reduce blood cortisol levels.

Jones et al. (2013) conducted a systematic review of the field of respiratory distress and hyperventilation in adults. In the review, one research was included, which showed that relaxation therapy and breathing techniques can clearly reduce the frequency and severity of hyperventilation attacks. Chenivesse et al. (2014) demonstrated that individuals with a present hyperventilation syndrome had a statistically lower quality of life score measured with SF-36 compared to asthmatics or COPD patients. Santino et al. (2020) found that breathing techniques after 4 months of exercise had a positive effect on the symptoms of hyperventilation, which was assessed with the Nijmegen questionnaire. Respiratory techniques also affect the improvement of quality of life and lung function. Research on female teachers has shown that breathing exercises can improve the maximum phonation time and the maximum number of utterances time (MCD). These are the methods that show the lung capacity of an individual (Saiban, Prathanee & Piromchai, 2017). In a five-year study, Hagman et al. (2011) showed that respiratory training in individuals with respiratory dysfunction can improve the physical component of the quality of life as measured by SF-36 from 42 to 47 ($p = 0.03$). The number of emergency medical visits decreased from 18 to 2, and the number of symptoms as a result of respiratory disturbances also decreased. People had fewer general breathing problems in their daily lives and during exercise. Jerath et al. (2015) found in a study that breathing techniques can be an alternative treatment for stress, anxiety, depression and some emotional problems. Ma et al. (2017) demonstrated that 8 weeks of diaphragmatic breathing training can affect attention, affect and lower cortisol levels in the body.

Discussion

In recent years, the popularity of breathing techniques has been growing, but they still have a mystical touch of the East. Despite the lack of evidence, these techniques have long been used as a method of treating disorders in respiratory patterns and the hyperventilation syndrome. Respiratory techniques affect the respiratory system, the cardiovascular system, the cardiorespiratory system and the autonomic nervous system (Russo, Santarelli & O'Rourke, 2017). Thus, the main task of breathing exercises is to reduce the frequency of respiration and increase the volume of respiration. Most often, patients learn to control breathing with relaxed abdominal breathing and use the lower chest in different positions: sitting, lying down, standing. Buteyk's method of breathing is one of the first to spread from Russia across the world and it has been used to treat many chronic diseases, most commonly in patients with asthma. Breathing exercises also include yogic pranayama, which emphasizes mental concentration in order to reduce the frequency of breathing and normalize the relationship between the inhalation and the exhalation with a pause after

each inhalation and exhalation. These techniques can always be adapted to the needs of a patient. The goal of breathing exercises is to encourage patients to gradually change their breathing patterns, restore them and maintain them. In this way, the respiratory centre in the brain is newly "programmed" and allows inhalation to occur in the presence of a higher concentration of carbon dioxide. The research results give us mixed information, mainly because the field associated with respiratory techniques, lung function and quality of life is poorly researched. There is a connection between breathing exercises and factors of the overall quality of life and health in adults without medically diagnosed medical conditions. Since hyperventilation is not a disease but a disorder, it can be argued that in individuals with respiratory pattern disorders, the health-related quality of life improved (Chenivesse et al., 2013) and the number of respiratory disorders in daily life and during physical activity decreased. Stress caused respiratory disorders less often, there was also a decrease in emergency medical visits (Hagman et al., 2011). However, people with respiratory pattern disorders have higher BMI values. Obesity is a common reason leading to shortness of breath and a more frequent occurrence of anxiety, depression, sleep apnoea and gastro-oesophageal reflux (Sedeh et al., 2020). Identifying problems in the breathing pattern due to exertion, air obstruction or disturbances in the breathing pattern is not easy. When symptoms remain unexplained, fear of the disease may increase and the possibility of physical activity may decrease, which in turn increases the risk of developing chronic diseases.

Conclusion

Breathing techniques have great potential in improving the quality of life in adults, especially those who unconsciously over-breathe or hyperventilate. Research in healthy adults is lacking; however, on the basis of our short review, we can conclude that breathing exercises in healthy adults are connected to the assessment of the quality of life and the improvement of lung function. We also noticed that this field is poorly researched.

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Egalitarian distribution of health maintenance using technologies for life extension

Martin Lipovšek

University of Ljubljana, Faculty of Arts, Aškerčeva cesta 2, 1000 Ljubljana, Slovenia
martin.lipovsek@gmail.com

Abstract

Background and purpose: Background of our paper is the thesis that, under certain conditions, life-extension medical technologies should be available to all citizens through free public health care. The purpose of the proposed thesis is multifaceted. First, by offering life extension, which we define as medical and pharmacological therapies that work against the biological aging process and some of which can be expected in the near future, we would maintain and strengthen the health of the population - including the working population. As a result of these interventions in the body, this population would be more vital in old age and could thus remain active for a longer period of time. Secondly, prolonging life is something that the majority of the population wants - to be healthy and live longer. This thesis can be firmly supported by empirical sociological research. And third, if prolonging life under certain conditions, the main condition of which is recalculated financial eligibility, would be part of public health (and not just what only the rich can buy), it would satisfy our idea of social justice as we can perceive it through egalitarian political-philosophical theories. *Presentation of the content*: For the above thesis it is possible to present arguments for and against. If we rely on the tradition of the liberal philosophical position represented by John Rawls, we can defend the position presented above. The main argument here is the application of the veil of ignorance to the concrete question of the fair distribution of medical devices. But there are also arguments from some other ethical and political-philosophical traditions. The concept of justice in prolonging life has been extensively written about by dr. Adrian Bunn, to whom we also refer in the article. *Conclusions*: With the expected arrival of life extension, new questions open up and new ethical and political-philosophical dilemmas emerge. One of these new questions is whether or not to provide some of these new technologies to all citizens to choose freely. The liberal political-

philosophical tradition not only allows such new technologies, but under certain conditions places an ethical requirement on society that these technologies are accessible to all, not just to the rich.

Keywords: Key words: public health, life extension, philosophy

Introduction

The starting point of our paper is the thesis that, under certain conditions, life extension medical technologies should be available to all citizens through free public health care. Medical technologies to prolong life, or in other words longevity technologies, are understood as medical and pharmacological therapies that work against the biological process of ageing (slowing down, stopping, regenerating the body) and some of them can be expected in the near future. As a result of these interventions in the body, the population could be vital longer into old age and thus remain active for a longer period of time. Lipovšek (Lipovšek, 2019) has already written about them in Slovenia, and on a global scale they are presented through the works of de Gray (de Gray, 2008), Sinclair (Sinclair, 2019) and Otin (Lopez-Otin et al, 2013).

Our thesis at the beginning of this paper appeals to the state to set requirements for the operation of free public health. The authors advocate approach of egalitarianism represented by the philosophy of John Rawls (Rawls, 2011) and an additional theoretical assumption. In short, John Rawls places his philosophy of justice on the following foundation. The theory is based on lexical priority. The first principle is "Everyone should have the same right to the most comprehensive system of equal fundamental freedoms, compatible with a similar system of freedoms for all" (Rawls 1971, pp. 302-3) (Kymlicka 2015, p. 94). The second principle reads: "Social and economic inequalities must be regulated in such a way that they are at the same time: a) for the greatest benefit of those at their worst, and b) linked to public services and positions accessible to all under conditions of fair equality of opportunities. First priority rule (priority of freedom) - the principles of justice must be classified lexically and therefore freedom can only be restricted in the name of freedom. Second priority rule (priority of justice over efficiency and well-being) - The second principle of justice is in lexical order over efficiency and before the principle of maximizing the sum of benefits; and the fairness of opportunities precedes the principle of difference"(Rawls 1971, pp. 302-3) (Kymlicka 2015, p. 95). An additional theoretical assumption that the state would distribute life extension services rather than money cannot, unfortunately, be fully substantiated in this paper due to limitations. In practice, it can be quickly defended - because the state may have a greater interest in distributing services than individuals to buy life extensions. A philosophical rationale, however, would require extensive argumentation and consideration of whether it can be derived from Rawls 'philosophy. To make the initial thesis from the beginning of the article clear, we will present what we mean by the phrase "certain conditions". Certain conditions

may be such that the state is bound by ethics and justice to provide life extension unconditionally or is conditionally bound to do so. In our paper, we will only talk about the first option, because the second option would require a discussion that would significantly exceed the limitations of this writing. Let us first look at the specific conditions in which we claim that the state is obliged to extend life unconditionally. We will also use an example to illustrate the conditions. Some of the conditions for life extension must be: life extension technologies are easy to distribute, the cost is relatively low, efficiency is scientifically validated and quantified, the gain of extra healthy years of life is relatively large, side effects are relatively negligible and people can freely choose whether or not to participate in life extension technologies. The key condition, however, is that after a certain number of years, when the program of free distribution of life extension technologies begins, the state treasury has gained or at least lost nothing financially with the costs of the program. By this, we mean that if we add up the costs of these technologies and all the costs involved (bureaucracy, distribution, control, awareness, the cost of waiting for the return of state investment in the program), these are less than or equal to the inflow into the state treasury because of the following things. Successful and effective life extension technologies are pushing the ratio of healthy years of life to sick years of life significantly in favour of healthy years. As a result, the costs the public health system has with these people are much lower. People with longer and healthier lives can work longer and thus pay taxes for longer. For example, by looking after grandchildren and great-grandchildren, by being consultants in companies and institutions, by workong in socially beneficial organizations they also benefit the society. A realistic example in which the state would be unconditionally obliged to provide life extension is if we had evidence that metformin is extremely effective. A multi-year study of TAME in the USA is currently being prepared, which will scientifically study the effect of metformin on life expectancy and health on a very large sample of people (Tame trial, 2020). Metformin is exceptionally cheap due to the expired patent, 100 tablets in Slovenia cost 5€ (Javna agencija RS, 2019). Realistically, we can imagine that metformin will turn out to be a drug that statistically adds a few healthy years of life to the average person. And from accurate data, we could calculate whether the state investment in the metformin program would be fully refunded or not. The state would be conditionally obliged to prolong life if the total cost of the life extension program was greater than the financial income from it. We use the word conditionally because in this case it would be necessary to take money away from other areas of the budget (health or overall), which would mean setting priorities. For example, if metformin were very expensive and the funds could only be drawn from the health fund, there could be a dilemma as to whether the funds could be used for people who want to prolong their lives or treat cancer.

We can argue for a practical defense of a situation in which certain conditions are met, so that the provision of life extension can be described as uncon-

ditionally necessary. The health and sustainability of the working population would be strengthened. Social investment in people (schooling and training) would be maintained for a longer period of time. If people would like to do this themselves, we can also assume that they would be happier because of it. Otherwise, they could stop using life extension technologies on a regular basis (the authors of the article also defend the opinion that based on the argument from autonomy, people should also have the right to euthanasia if they suffer immensely). The general argument against prolonging life is the problem of limited global resources. However, since we are not talking about a miracle potion for immortality but for a few more years of health that would help the economy or leave intact, then we see that this accusation is not solid. According to our scenario, we have intact investment opportunities in green technologies. The practical defence also includes the opinion of the people - they clearly want life extension technologies, which means that there is a democratic will and preference for these technologies. The opinion of Slovenes was found in a sociological survey from the spring of 2020 on 761 respondents. The results of the research were presented at two conferences - the international conference Metchnikoff Day Conference and the Slovenian conference Being a hundred years young. To the question "If I had the opportunity, I would use biomedical therapies if they enable us a longer and healthier life." 24% of people answered with strongly agree, 57% agree, 15% disagree and 4% strongly disagree. People want more activities of the state: "I want the state to invest in the development of biomedical therapies that would enable longer and healthier life." On this question, 26% of people answered with I completely agree, 56% agree, 12% disagree and 6% completely disagree. In the end, it is evident that the desire for universal access to life extension is almost unanimous: "I would be angry if biomedical therapies that enable a longer and healthier life were available only to the rich." 64% answered with I strongly agree, 31% agree and only 3% disagree and 2% strongly disagree (Metchnikoff day, 2020) (Biti mlad sto let, 2020).

Several political-philosophical theories could be used to philosophically address our question. For example, libertarianism, utilitarianism, lexical egalitarianism, and Rawlsian egalitarianism were addressed by Adrian Bunn (Bunn, 2015). We limit ourselves to the last of these. This does not mean that other theories are not relevant or important for some future research. In the case where the state is committed to the conditional provision of life extension technologies, the second principle of Rawls' philosophy, point a), comes into play. We can ask what it is like in the case where the state is committed to the unconditional provision of life extension technologies. In this case, we argue, however, Rawls 'logic follows the first principle of his philosophy of justice presented. Namely, the right to life is a fundamental freedom and also the right to health. And if the exercise of these two rights does not conflict with the rights of other people, as in our case (for example, a cancer patient is not harmed in any way), then people can unconditionally claim the above rights for themselves. Their demand stems from the principle of freedom, not just from the

principle of equal distribution of economic goods. If a state follows Rawls' logic of justice and the additional theoretical assumption that it must provide services not just money, then it is obligated to do what the initial thesis of the paper speaks of.

Conclusion

To conclude, Aubrey de Gray, at the conference Being Hundred Years Young (Biti mlad sto let, 2020), when he was asked about the fairness of life extension technologies, he simply answered that this is not a problem at all. When efficient technologies will come, they will pay for themselves and states will therefore provide them to all the citizens.

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Hiring older people as a way to increase diversity and improve the quality of society

Marjeta Logar Čuček

Ljubljana University Medical Centre, Department of Oral and Maxillofacial Surgery, Zaloška cesta 2, 1000 Ljubljana, Slovenia
marjetalogar@gmail.com

Abstract

Introduction: The co-called »new reality«, as observed both in Slovenia and abroad, does not favour the employment of older population. Older people, who are still active, are labelled as high-risk groups that need special health care. The society expects an active participation of every individual– being knowledgeable about the world, understanding the events and environment leads us to value expertize, work experience and critical reasoning of older employees. They need to be given an active role, but not under conditions that drive a worker into absenteeism, failing to appear at work, even without health reasons, or presenteeism, being present at work at all costs. The latter, in particular, should not be admissible. The current situation clearly shows that each individual should be able to, if they fall ill, quarantine themselves. An employee who understands when their behaviour might endanger others, should never be dismissed by an employer as old or useless. The purpose of this study is to find out to what extent the two phenomena have been researched at the post-graduate level at medical faculties, faculty of health sciences or health care faculties in Slovenia, considering various risk factors present at work and maintaining effort to extend the years of service of older employees. *Methods*: Master's and Doctoral theses from chosen faculties, published online between 2015 and 20202, have been studied by using the PRISM protocol. The identified hits have been described, analysed and evaluated. *Results*: Abstenteeism has been researched in different postgraduate study programmes, including health studies, whereas presenteeism, which is increasingly observed in current time, has so far not been dealt with in the scope that would provide a more thorough insight into finding solutions. The employment of older population is presented in the sense of maintaining their physical fitness, partially also as a stress-coping mechanism. The influences of other psychosocial factors still remain insufficiently explored, considering the

complexity of the issue. *Discussion and conclusion*: Both absenteeism and presenteeism are frequently the result of a fear of the »impossible« or »loss«. The changes in society are more often than not dependent on the changes in an individual's value system. New values slowly but surely take root in all pores of society; the process is greatly accelerated by development and science. The research into the consequences of aging society and longevity and the growing importance of employment of older population has so far not been widely conducted on the academic level and, consequently, changes and improvements have not been implemented in real life yet. Monitoring and analysing of improvements are of vital importance. The improvements that have already been achieved in the field of equal treatment of older people in employment can be cancelled out, sometimes very subtly, by a change on the global, or even local level. Activities intended to increase the years of service of older population should, therefore, not be pushed aside as less important. Diversity, as a key characteristic of humanity, even in the golden years, leads to outstanding results and higher quality of life.

Keywords: employment, working conditions, excessive workload, presenteeism, absenteeism

Introduction

Increasing the duration and improving the employment of older population has until recently been a goal of economic entities and political decision. This has led to the need to increase the period of active service due to the fact that older employees, who can draw on the knowledge and experience obtained over several decades, have a desire to learn and are able to adapt to the new economic circumstances, are of vital importance to active and productive society (Novoselc, 2019; Logar Čuček, 2020).

At the moment, the so-called »new normal«, resulting from the consequences of the epidemics and the consequent economic downturn, both at home and abroad, significantly contributes to increasingly unfavourable conditions for older population since longer employment is not encouraged. The principle of lower market flexibility and higher job protection is coming into the foreground, together with lowering the percentage of precarious jobs (Gaspari, 2020), which could also mean encouraging older employees to retire. The companies that make use of the so-called exit strategies, i.e. early retirement and lay-offs, tend to fall behind those that are successful in overcoming demographic and competition challenges (Van Dalen et al., 2015). Identifying job risk factors and their mitigation, creating the culture of health and good work, together with adapting working hours and job accessibility, all lead to the creation of jobs that are beneficial for all age groups and not only for older population (Tratnik, 2019).

Frequently employees cope with the pressure at work, by absenteeism or absence from work, or presenteeism, coming to work despite the need for re-

cuperation (Logar, 2011; Logar Čuček, 2020). There are many sides to absenteeism, owing to that fact that it is practised by humans. Employees stay away from work from a variety of reasons (Kirkham et al., 2015). To a smaller extent, absenteeism is the result of non-medical reasons which are often manifested as justifiable absence from work (Bilban, 2007). No matter what form absenteeism takes, its reasons and duration, it can decrease the activity of older employees and consequently lead to premature retirement (Wargo-Sugleris et al, 2017).

Presenteeism is one of the »side-ways« of management. Many organisations wrongly assume that a low level of sick leave signifies good employee health. Consequently, employees appear in their workplaces despite being ill, feeling unwell, suffering from psychological problems. Many of them are worried about their job security and are not willing to take risks – especially people with families and those just a couple of years before retirement (Lalič and Hromin, 2012). In some employees, presenteeism is a matter of individual decision (Brečko 2012; Boštjančič and Sajinčič, 2016).

The purpose of reviewing published materials at the post-graduate levels at three medical faculties in Slovenia was to study Master's theses and Doctoral dissertations that deal with the phenomena of absenteeism and presenteeism in older employees.

The objective of the study was to ascertain to what extent the phenomena of absenteeism and presenteeism of older employees are studied in Slovenia at health-related institutions and to prepare suggestions for such research.

The research question posed was: What is the purpose and role of post-graduate research on the influence of absenteeism and presenteeism on older employees?

Methods

Review methods

A review of Master's theses and Doctoral dissertations, published online between 2015 and 2020, was used. Faculty databases were chosen for finding references since the objective was to find out to what extent the area of older employees is researched at the post-graduate level. The following combinations of key words in Slovene language were used as search entries: older employees, employment of older populations, absenteeism and presenteeism in older employees; later on, words which represent the conditions for successful work of different generations, such as promotion of health, lifelong learning were added. The search was carried out in the period between May 2020 and June 2020. The search was limited by the following inclusion and exclusion criteria: search period between 2015 and 2020, Slovene language, and freely available data.

Review results

Database search strategy came up with 66 hits. After checking their relevance, 20 hits were excluded. According to content relevance, 46 hits were obtained. After considering all limiting criteria, 6 hits were used for final reference. Figure 1 shows searching for Master's theses and Doctoral dissertations. A schematic presentation has been used, as enabled by PRISM scheme (Moher et al., 2009).

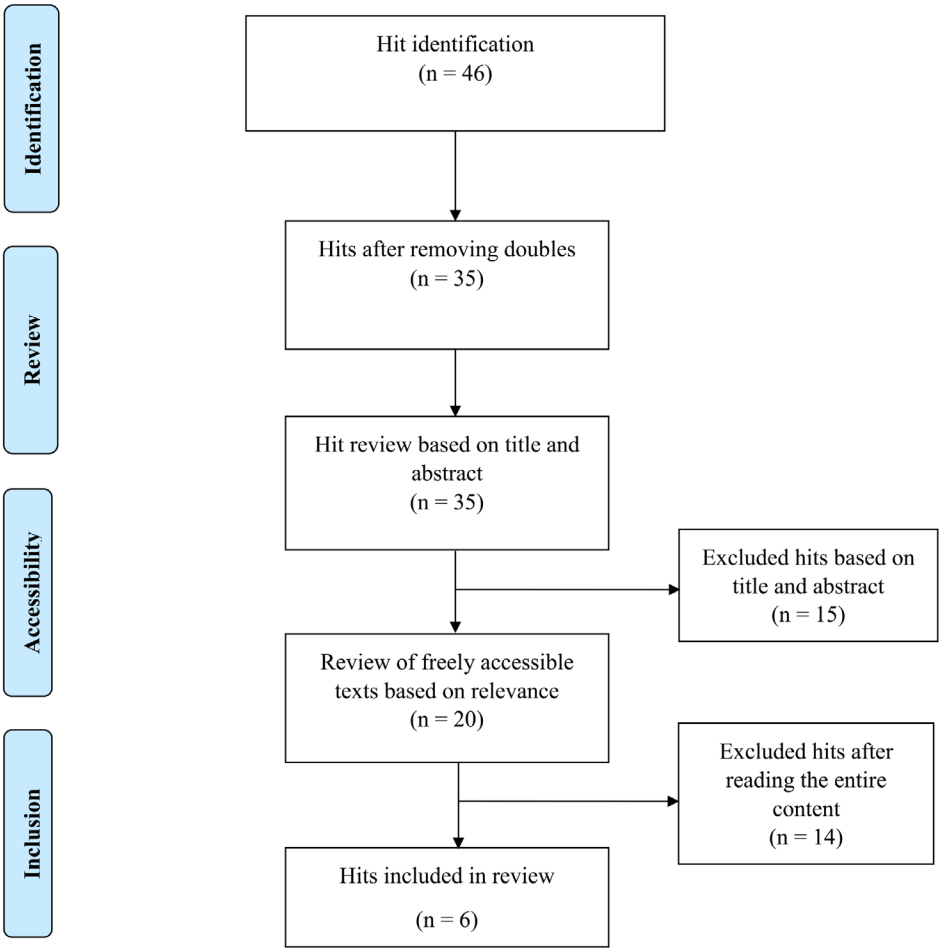

Figure 1: Results of the references review based on the PRISM

Data processing description

Data was analysed with the use of qualitative content analysis; according to Vogrinec (2008) open coding represents a key procedure of text analysis. A qualitative analysis was carried out in six steps, namely materials organising, coding, determining coding units based on key subject matter and purpose of systematic references review, selection and defining applicable key words and

categories, defining categories and making conclusions by achieving a better understanding of the issues and needs of older employees.

Results

Table 1 shows all references included in materials review. Using qualitative content analysis of the acquired materials, three categories with applicable codes were identified (Table 2). The categories include: (1) The influence of rheumatic disease on absenteeism; (2) The importance of lifelong learning for the application of knowledge at work; (3) The measures for improving physical and mental health in all periods of life. In the following stage of materials review, the categories were changed into subcategories and a single category was formed. This category offers a comprehensive explanation of the purpose and objectives of materials review (Table 2).

Table 1: A review of the key findings of the research included in qualitative content analysis

Author, year	*Research typology*	*Research objective*	*Sample*	*Key findings*
Križanec, 2016	Qualitative research	To find out if there are statistically relevant differences in the quality of life of patients suffering from inflammatory rheumatic disease treated with biological medicines in comparison to patients using standard medicines; to find out to what extent the disease can influence absenteeism.	n = 180	Patients taking biological medicines have fewer absences from work; they assess their quality of life higher; a need for greater health-educational work shown.
Robnik, 2016	Quantitative research	To establish the presence of elements of a learning organisation and employees' viewpoints regarding the introduction of training courses.	n = 57	Employees have demonstrated a high level of motivation for attending training courses.
Lešnik, 2016	Quantitative research	To recognise the viewpoints regarding acquiring new knowledge and to transfer knowledge from the management to the employees.	n =104	Knowledge obtained in training courses is put into practice in the work place.
Topličanec, 2018	Quantitative research; case study	To study the development of health-related absenteeism and presenteeism; to identify the limitations of health promotion programmes (HPP).	n = 198	The HPP programme is focused on improving health and includes preventive activities. Own health control is enabled in working environment; it reduces health-related absenteeism and contributes to lower presenteeism.

Author, year	*Research typology*	*Research objective*	*Sample*	*Key findings*
Raduha, 2017	Descriptive qualitative research	To compare the frequency of physical exercise on the basis of age, gender and education level; to express viewpoints regarding the importance of regular exercise.	n = 115	Differences in gender, age and education level do not influence the level of physical activity.
Saje Zupanc, 2015	Quantitative survey research	To study a part of the lifestyle of nurses and workplace risk factors in explaining the incidence of back pain.	n = 461	Back pain increases with age; it is connected with workplace stress and also unhealthy lifestyle. Ergonomic technical accessories are underused in clinical practice. It is vital to introduce aerobic exercise and take additional care of employees' physical health.

Table 2: Code allocation by category

Category	*Subcategories*	*Codes*	*Author*
Factors which positively influence the decrease in absenteeism and presenteeism in (older) employees	The influence of rheumatic disease on absenteeism.	The cooperation of nurses with rheumatic patients treated with biological medicines; the influence of biological medicines on the quality of life; lower levels of absence from work, absenteeism; the presence of pain.	Križanec, 2015
	The importance of lifelong learning for applying new knowledge and skills in the work place.	The importance of learning and knowledge for an individual and organisation; knowledge transfer; cross-generational cooperation; innovativeness.	Robnik, 2016; Lešnik, 2016
	Measures for improving physical and mental health in all life periods.	Education and training in the area of physical health maintenance; recognising negative orientation towards physical activity; focused physical activity in the workplace; coping with stressful situations.	Raduha, 2017; Topličanec, 2018; Saje Zupanc, 2015

Discussion

In the reviewed works, older employees are predominantly dealt with in that period of life when typically, due to various health issues and advanced age, they are no longer able to actively participate in the labour market. The health care of older employees, the development of social contacts, suitable communication, etc. are some of the research topics (Saje Zupanc, 2015; Raduha, 2017; Topličanec, 2018). The study of those segments of life which would allow an individual to keep an active role in society is carried out in »fragmental form« and is subordinate to other age groups. The society is faced with longevity, at the same time, Slovenia is a country that does not live according to the principles of active aging, as promoted by the European Union (Walker and Zaidi, 2016).

In the research that was conducted as a part of her Master's thesis by Križanc (2016), absenteeism is presented as a consequence of an illness or insufficient results of treatment with conventional medicines. There are several studies at different post-graduate level programmes that deal with the phenomenon of absenteeism, yet only few at healthcare faculties. On the other hand, presenteeism, which has been recognised as a problem only recently, has not been researched in the scope that would provide a greater insight into finding specific solutions. Absenteeism and even more so presenteeism are often the consequence of fear of the »impossible« or »loss« and are harmful both for the employee and organisation, financially as well as medically (Vučković, 2010; Logar, 2011). Both phenomena are unacceptable: absenteeism also because it offers employees a possibility for abusing the sick leave system; and presenteeism, in which an employee understands that their medical state might be endangering to others but can be labelled as incapable, old and fit for retirement if they remain absent from work. Both society and the government need to introduce measures that will allow a person to be ill and recover in peace but at the same time prevent employees from abusing the system (Logar et al., 2015).

Taking care of health, by maintaining physical fitness and partially also managing stress, is dealt with in the reviewed materials without a special focus on older employees, which is confirmed also by other researchers (Logar, 2011; Ovčar, 2015; Jakop, 2016; Jagodič, 2019). The influences of psycho-social factors are not presented or rather they are not studied thoroughly enough, owning to their complexity and the fact that they are becoming the key causes of illness development. The connection between health and socio-economic position of older employees is key. Employees with lower levels of education, lower positions at work and lower income tend to suffer from cancer, cardio-vascular diseases and lower life expectancy (Manfreda, 2020). Preventive measures can go a long way in maintaining and improving people's health. They include various activities in health promotion programmes which are suitable for different generations (Saje Zupanc, 2015; Raduha, 2017; Topličanec, 2018).

One of the activities that helps to maintain good health is lifelong learning. The theses review demonstrated that many theses were prepared and studies carried out regarding learning organisation, the need for lifelong learning, passing the knowledge from generation to generation, which encourages cross-generational cooperation and strengthens knowledge of teams and organisations (Robnik, 2016; Lešnik, 2016).

Older employees already are or are about to become our reality. It is necessary to act in three ways: developmental strategy, management training, senior and junior staff training to achieve synergy – and in older employees also for quality aging before and after retirement (Ramovš et al., 2020).

The limitations of the survey conducted include a sample that is too small, owning to the fact that at healthcare faculties (Master's and Doctoral study) there is almost no published material about employment of older population, absenteeism and presenteeism. The phenomena of absenteeism and presentee-

ism in connection with older employees are mentioned together with other topics of research but not directly. It is of vital importance that a more exhaustive study of this issue is conducted and that more Master's and Doctoral theses deal with the employment of older employees. Too often it happens that older employees are discriminated against in their workplaces, despite the fact that life expectancy is rising and labour force is shrinking.

Conclusion

Aging society and increasing longevity with all their implications have a considerable impact on the employment of older population. It is of vital importance for the medical field to start considering the necessity to prolong the active service of employees. Modern times dictate research into older employees on the academic level since progress largely depends on the inclusion of all people in all their diversity.

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Sauerkraut and sour turnip consumption habits in Slovenia

Martina Nagode, Katja Bezek

University of Primorska, Faculty of Health Sciences, Polje 42, 6310 Isola, Slovenia
martina.nagode@hotmail.com; katja.bezek@fvz.upr.si

Abstract

Introduction: Fermentation is one of the earliest methods of food preservation. Along with the extended shelf life of foods, the fermentation process provides also higher safety and better organoleptic properties of the products. The fermentation can be carried out by the naturally occurring microbial community or by the addition of the so-called starter cultures. The metabolic activity of microorganisms significantly affects the bioavailability and concentration of bioactive compounds in the product. However, the viability and number of beneficial living microorganisms depend on many factors, such as storage and processing conditions of the foods. *Methods*: In order to obtain the data on the knowledge and eating habits of sauerkraut and sour turnip among Slovene people, an online questionnaire was prepared. The obtained data were analysed using IBM SPSS Statistics 26 and Microsoft Excel. *Results*: In the present questionnaire-based survey 175 individuals were included (24 M; 151 W). The majority of the participants showed great knowledge about fermented foods and their health benefits. Moreover, half of participants prepare fermented foods at home. In the last month the vast majority consumed cooked (n = 152) or raw (n = 121) sauerkraut, while the lower proportions consumed cooked (n = 54) or raw turnip (n = 95). Only a few (n = 14) did not consume any. Among consumers on average 204 g of cooked and 179 g of raw sauerkraut and 188 g of cooked and 136 g of raw sour turnip was consumed in the last month. *Discussion and conclusion*: By regular and adequate consumption of sauerkraut and sour turnip, both raw and heat-treated, a beneficial effect on the immune and digestive system and the general health of the working-age population could be achieved. However, live probiotic microorganisms can positively affect human health only when consumed in sufficient concentration, which is at least 10^8 to 10^{10} CFU per day. The last could be achieved by a daily intake of

100 g of product with at least 10^6 CFU ml^{-1} live microorganisms. Considering this study results, the intake of live microorganisms only by raw sauerkraut or turnip consumption among Slovene people is not sufficient to achieve a probiotic effect.

Keywords: sauerkraut, sour turnip, fermentation, microorganisms

Introduction

Fermentation is a traditional food preservation method used to extend shelf-life, safety, and impart desirable organoleptic properties of the foods (Shiferaw Terefe, 2016). This food processing technology utilizes the growth and metabolic activity of microorganisms for the stabilization and transformation of food raw materials (Di Cagno, Coda, De Angelis and Gobbeti, 2013). Fermentation of vegetables, fruits, and grains most often includes lactic acid fermentation involving different species of lactic acid bacteria (LAB) (Steinkraus, 1992). In addition to spontaneous fermentation, the controlled fermentation can be carried out by the addition of starter culture, a standardized community of microorganisms. However, the diversity of the microbiota markedly depends on the intrinsic and extrinsic parameters of the plant matrix (Di Cagno et al., 2013). Furthermore, the growth of spoilage and pathogenic organisms is inhibited by high salt concentrations, LAB metabolites, and the consequent decline of pH value (Shiferaw Terefe, 2016).

Sauerkraut is one of the most common and oldest forms of raw vegetable preservation. It is produced by spontaneous fermentation of cabbage under anaerobic conditions, with the addition of salt. The fermentation process takes several weeks at a temperature of 15 to 20 °C (Oregon et al., 2016). Important strains of bacteria present in sauerkraut are *Leuconostoc mesenteroides*, *Lactobacillus plantarum*, and other genera like *Leuconostoc*, *Lactobacillus*, *Pediococcus* and *Weissella* (Touret, Oliveira and Semedo - Lemsaddek, 2018). Like sauerkraut, the sour turnip was an important food in ancient times, consumed mainly in the winter months. Raw material is prepared by placing the washed turnip into a vat, in Italian culture the turnip was alternatively layered with grape skins. Before covering the vat, a mix of water and salt or water only is added and left for 30 to 40 days at 12 to 15 °C. The most commonly represented LAB are *Lactobacillus hilgardii* and *Pedicoccus parvulus* (Maifreni, Marino and Conte, 2004). Nevertheless, due to the presence of live microorganisms that possess probiotics properties, antimicrobial, antioxidant and peptide production, fermented foods are known for its beneficial nutritional and functional properties for consumer's health (Septembre-Malaterre, Remize and Poucheret, 2018; Şanlier, Gökcen and Sezgin, 2017).

Methods

In the first part of the study literature review on the fermentation process with the focus on vegetables was made including the scientific articles not older than

10 years. To obtain the data on the knowledge and eating habits of sauerkraut and sour turnip among Slovene people, an online questionnaire was prepared. The obtained data were processed using Microsoft Excel and SPSS Statistics 26.0 (IBM, Armonk, NY, USA).

Results

The health benefits of fermented vegetables can be associated with their prebiotic and/or probiotic potential, due to the presence of live microorganisms and their metabolites, such as bioactive peptides, short-chain fatty acids or polysaccharides (Septembre-Malaterre, et al., 2018; Şanlier et al., 2017). Probiotics are live microorganisms that, when consumed in sufficient amounts, may confer a health benefit for the host (FAO/WHO, 2002). They help maintain good balance and composition of the intestinal flora, preventing the invasion of pathogenic microorganisms (Tripathi and Giri, 2014), improve immunity and calcium absorption, reduce the risk of intestinal diseases (Homayouni, Pavahoo and Azizi, 2012), lower serum cholesterol and blood pressure (Rašić, 2003). Most of the commercially used probiotics belong to LAB group, including *Lactobacillus*, *Leuconostoc*, *Streptococcus*, and *Enterococcus* genera (Yadav, 2017). To achieve positive effects, foods should contain the required minimum number of live microorganisms with a probiotic effect at the time of ingestion. The recommended standard for probiotics live cell counts is at least 10^6 CFU mL^{-1} of the product (Neffe-Skocińska, Rzepkowska, Szydłowska and Kołożyn-Krajewska, 2018). Furthermore, many LAB species have antimicrobial activity due to the production of antimicrobial active metabolites, such as organic acids, hydrogen peroxide and other compounds, such as bacteriocins and antifungal peptides (Reis, Paula, Casarotti and Penna, 2012). Moreover, produced bioactive peptides are known for the functional properties, such as immunomodulatory, antithrombic and antihypertensive effect (Tamang et. al., 2016).

In the present study, we focused mainly on sauerkraut and sour turnip, both a result of LAB fermentation. In data analysis of a questionnaire-based survey 175 individuals were included (24 M; 151 W). Based on the study results, the majority of the participants showed excessive knowledge about fermented foods and their health benefits (Table 1). To begin with, half of the participants prepare fermented foods at home. The majority (> 60 %) of them agreed with statements as follows: (i) salt addition inhibits the action of unwanted microorganisms and allows the reproduction of the desired ones; (ii) temperature is an important factor in the fermentation process; (iii) an anaerobic environment must be established for fermentation; (iv) sugars are converted to acids during fermentation and (v) that the pH of the food before and after fermentation varies. Although, the majority of them knew that fermented foods have an extended shelf life (81 %), only half of them agreed that fermented foods are more microbiologically safe.

Table 1: Respondents agreement with the statements

Statement	*I do not agree*	*I neither agree not disagree*	*I agree*
We need to add salt, which inhibits the action of unwanted microorganisms and allows the reproduction of the desired ones.	14 (8 %)	34 (19 %)	127 (73 %)
Temperature is an important factor in the fermentation process.	6 (3 %)	18 (10 %)	151 (86 %)
We need to provide anaerobic conditions.	23 (13 %)	40 (23 %)	112 (64 %)
In the fermentation process, sugars are converted to acids.	13 (7 %)	50 (29 %)	112 (64 %)
The pH value of a food changes (pH value allows us to define a substance as acidic, neutral or basic).	2 (1 %)	24 (14 %)	149 (85 %)
Fermented foods have an extended shelf life.	7 (4 %)	27 (15 %)	141 (81 %)
Fermented foods are more microbiologically safe.	14 (8 %)	67 (38 %)	94 (54 %)
Fermented foods are richer in vitamins.	33 (19 %)	70 (40 %)	72 (41 %)

Regarding the consumption in the last month, the vast majority consumed cooked (n = 152) or raw (n = 121) sauerkraut, while the lower proportions consumed cooked (n = 54) or raw turnip (n = 95). Only a few (n = 14) did not consumed any. On average 204 ± 176 g of cooked and 179 ± 150 g of raw sauerkraut and 188 ± 172 g of cooked and 136 ± 136 g of raw sour turnip was consumed in the last month.

Discussion

During food fermentation, functional microorganisms transform raw material constituents, thereby enhancing the nutrition value, sensory properties and safety, degrading toxic substances, producing antioxidant and antimicrobial substances (Tamang Shin et al., 2016). Sauerkraut and sour turnip are locally produced processed vegetables and are also used as major components of traditional Slovenian foods (Korošec, Golob, Bertoncelj, Stibil and Koroušić Seljak, 2013). As expected, this study participants showed good knowledge about the fermentation process. Surprisingly, the lowest level of agreement was for a statement about the fermented foods being a better source of vitamins than raw material. However, as reviewed before, the probiotic, antimicrobial and antioxidant effects of fermented vegetables have a beneficial potential for human health (Tamang Shin et al., 2016). We focused mainly on the probiotic effects of sauerkraut and sour turnip. Live microorganisms with a probiotic potential can have a positive effect on our health only if consumed in sufficient amount, which means at least 10^8 to 10^{10} CFU per day (FAO/WHO, 2002). This would mean consuming 100 g of food with at least 10^6 CFU mL^{-1}. Oregon et al. (2016) found that 100 g of sauerkraut contains 5×10^6 CFU. Considering present study results, the intake of live microorganisms e.g. by 179 g of raw sauerkraut per month, meaning 3×10^5 CFU per day is not in accordance with recommendations. Furthermore, the microorganisms found in sauerkraut and sour turnip are diverse and not all have probiotic effects (Zabat, Sano, Wurster, Cabral

and Belenky, 2018). It should also be noticed that many fermented foods are heat-treated after fermentation to enhance food safety, which can significantly influence the number of microorganisms (Rezac, Kok, Heermann and Hutkins, 2018).

Conclusions

The live microorganisms with probiotic properties present in fermented foods have a beneficial effect on intestines, prevent the action of pathogenic microorganisms, improve the immune system, and general health. Considering this study results, the intake of live microorganisms only by raw sauerkraut or sour turnip consumption among Slovene people is not sufficient to achieve a probiotic effect. Therefore, the intake of probiotic microorganisms with other foods or dietary supplements is recommended. With regard of the questionnaire results, the benefits of Slovene traditional food should be more promoted.

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The effect of kefir and milk intake on intestinal permeability

Karin Novak, Zala Jenko Pražnikar, Ana Petelin

University of Primorska, Faculty of Health Sciences, Polje 42, 6310 Izola, Slovenia
karin.novak@fvz.upr.si, zala.praznikar@fvz.upr.si, ana.petelin@fvz.upr.si

Abstract

We performed a longitudinal intervention study that lasted 4 months at the UP Faculty of Health Sciences in Izola. The participants were divided into two groups, each alternately consuming kefir or milk for 21 days, with two washout periods in-between. Venous blood was sampled (fasted) after each phase and the participants completed a questionnaire on gastrointestinal symptoms and a Bristol stool scale. Kefir supplementation resulted in a greater improvement of serum zonulin levels whereas significant yet similar improvement in lipid profile, serum glucose levels, inflammation markers and appetite were found in both supplementations. We did not observe significant changes in the incidence of gastrointestinal symptoms, with the exception of significantly decreased sensation of bloating after kefir intake. The average number of defecations increased after kefir intake and decreased after milk intake. The percentage of participants who defecated at a consistent time each day decreased after kefir intake and increased after milk intake. We conducted one of the first studies comparing the effects of kefir and milk on the human intestine. Our research shows that daily kefir consumption could be an effective strategy for individuals with constipation and bloating. There is still a lack of solid evidence for the use of probiotics for most medical conditions.

Keywords: kefir, milk, zonulin, intestinal permeability, inflammation

Introduction

Cow's milk and fermented dairy products, such as yogurt, buttermilk and kefir, have been a major part of our diet for many years (Kok and Hutkins, 2018) and have beneficial health effects (Bourrie et al., 2016). The intake of dairy products has been linked with reduced risk of obesity, hypertension, type 2 di-

abetes and heart disease (Li et al., 2018). Kefir is a fermented dairy product containing a large number of lactic acid bacteria and yeasts (Kim et al., 2017). The largest bacterial community in the human body is located in the gastrointestinal tract (Bischoff et al., 2014) and it's known that a diverse gut microbiota and increased intestinal permeability plays a key role in inflammation that accompanies chronic diseases and in maintaining health (Kim et al., 2017). It modulates the expression of many genes in the gut that are associated with immunity, nutrient absorption, energy metabolism, and gut barrier function (Bell et al., 2018). The human gut is surrounded by a layer of epithelial cells that forms a barrier between the environment and the host. Increased intestinal permeability is thought to be an important element in the pathogenesis of chronic inflammatory diseases, in addition to genetic and environmental factors. Zonulin is so far the only known physiological intercellular modulator of intestinal tight junctions (Sturgeon and Fasano, 2016) and it's a biomarker showing altered intestinal barrier function in many autoimmune, neurodegenerative and tumor diseases (Fasano, 2012). The specific pathophysiological role of zonulin in various diseases is not well known, but elevated zonulin levels are thought to be a key factor in the onset of the inflammatory process (Sturgeon and Fasano, 2016). Despite the prevalence of dairy products, there has been very little research done on the effects of kefir and milk intake on the intestine, especially in humans.

Methods

We performed a longitudinal intervention study, which lasted from March to June 2018 at the Faculty of Health Sciences in Izola. The study included 28 healthy individuals (13 men and 15 women) aged between 31 and 64 years, with a BMI between 25 and 30 kg/m^2. The exclusion criteria were: any acute or chronic illness, lactose intolerance or milk allergy, taking medication, BMI < 25 kg/m^2 or BMI > 30 kg/m^2, pregnancy and lactation, significant body weight change in the last 3 months. The participants were divided into two groups, each alternately consuming kefir (250 ml daily) or milk (250 ml daily) for 21 days, with two washout periods in-between. During the washout periods complete abstitence from fermented dairy products was required. After each phase venous blood was sampled (fasted) and was then analyzed with Cobas c 111 analyzer (Roche Diagnostics) and with enzyme-linked immunosorbent assay (ELISA) for serum zonulin levels. After each phase participants completed a questionnaire on gastrointestinal symptoms – nausea, bloating, borborygmus, stomach pain, flatulence and heartburn. They also completed a Bristol stool scale. Participants were instructed to try to keep their diet as normal as possible throughout the study.

Results

Serum zonulin levels

Table 1 shows the mean and standard deviation of serum zonulin values before and after kefir and milk intervention.

Table 1: Mean serum zonulin levels before and after kefir and milk intervention

	Before kefir	*After kefir*	*Before milk*	*After milk*
	Mean	*Mean*	*Mean*	*Mean*
Serum zonulin levels (ng/ml)	1,089±1,425	0,940±0,923	0,866±0,864	0,837±0,913

The results of the Wilcoxon test of predicted ranks showed that both kefir intervention (z = -0,222; p = 0,824) and milk intervention (z = -0,336; p = 0,737) did not have a statistically significant effect on the change in serum zonulin levels.

Analysis of covariance (ANCOVA), with gender, age, BMI and baseline zonulin levels as covariates, showed that the change in serum zonulin levels after kefir intervention was statistically significant (p < 0,001), but not after milk intervention (p = 0,162). Kefir supplementation resulted in a greater improvement of serum zonulin levels whereas significant yet similar improvement in lipid profile, serum glucose levels, inflammation markers and appetite were found in both supplementations. CRP and adiponectin were not significantly affected by neither of the two interventions (Jenko Pražnikar et al., 2020).

Gastrointestinal symptoms

Table 2 shows the mean value of the occurrence of gastrointestinal symptoms before and after kefir and milk intervention and the results of paired-samples t-test. It showed a statistically significant change only in the feeling of bloating before and after the kefir intervention (p = 0,043), whereas the other changes in the incidence of gastrointestinal symptoms were not statistically significant.

Table 2: The occurrence of gastrointestinal symptoms before and after kefir and milk intervention and paired-samples t-test

	Before kefir	*After kefir*	*Paired-samples t-test*		*Before milk*	*After milk*	*Paired samples t-test*	
*Gastrointestinal symptoms**	*Mean*	*Mean*	*t*	*p*	*Mean*	*Mean*	*t*	*p*
Nausea	0,29±0,76	0,29±0,71	0,000	1,000	0,12±0,43	0,31±0,79	-1,044	0,306
Bloating	1,00±0,96	0,70±0,87	2,126	0,043	0,92±0,93	1,13±1,15	-0,816	0,423
Borborygmus	0,92±0,94	0,92±0,94	0,000	1,000	0,84±0,80	0,60±0,96	1,186	0,247

	Before kefir	After kefir	Paired-samples t-test		Before milk	After milk	Paired samples t-test	
Gastrointestinal symptoms*	Mean	Mean	t	p	Mean	Mean	t	p
Stomach pain	0,74±1,06	0,52±0,89	1,185	0,247	0,64±0,92	0,50±0,93	0,485	0,632
Flatulence	1,50±0,91	1,35±0,94	0,811	0,425	1,52±0,92	1,52±1,05	0,000	1,000
Heartburn	0,89±1,07	0,58±0,90	1,397	0,175	0,72±0,94	0,56±0,87	0,778	0,444

*Legend: * Gastrointestinal symptom values are expressed on a scale from 0 to 5, with 0 representing the absence of a gastrointestinal symptom and 5 representing the maximum intensity of occurrence of a gastrointestinal symptom.*

An independent samples t-test to compare changes in the occurrence of gastrointestinal symptoms after intervention with kefir and milk has shown no statistically significant difference in the the altered incidence of nausea (t = -0,895; p = 0,375), bloating (t = -1,788; p = 0,080), borborygmus (t = 1,051; p = 0,298), stomach pain (t = -0,712; p = 0,480), flatulence (t = -0,786; p = 0,435) and heartburn (t = -0,907; p = 0,369) between the groups.

Stool consistency, frequency and time of defecation

Table 3 shows stool consistency, frequency and time of defecation. Participants rated their stool consistency with a Bristol stool scale from 1 to 7, with 1 and 2 representing harder stool, 3 and 4 stool of appropriate consistency, and 5, 6 and 7 representing softer stool. Stool consistency became softer after both kefir and milk intervention. In each stage of the study participants defecated on average from 0,5 to 3 times per day. Frequency of defecation was slightly increased after kefir intervention and decreased after milk intervention. The percentage of participants who defecated at a consistent time each day decreased after kefir intervention and increased after milk intervention.

Table 3: Average number of defecation before and after intervention with kefir and milk

	Before kefir	After kefir	Before milk	After milk
Stool consistency	3,6	3,8	3,8	3,9
Number of defecations	1,3	1,4	1,4	1,3
Defecating at a consistent time (%)	78,3	70,0	69,9	77,3

Discussion

Kefir intervention resulted in a greater improvement of serum zonulin levels than milk intervention. Some studies have found beneficial effects of various probiotics on the serum zonulin levels and intestinal permeability (Liu et al.,

2013; Stenman et al., 2016), while some haven't (Stadlbauer et al., 2015; Mokkala et al., 2018). CRP and adiponectin were not significantly affected by neither of the two interventions. We did not observe significant changes in the incidence of gastrointestinal symptoms, with the exception of significantly decreased sensation of bloating after kefir intervention. In most studies, consumption of kefir or other probiotics had beneficial effects on most gastrointestinal symptoms (Kato-Kataoka et al., 2016; Lee et al., 2018; Yılmaz et al., 2019). Stool consistency became softer after both kefir and milk intervention. The average number of defecations increased after kefir intervention and decreased after milk intervention. The percentage of participants who defecated at a consistent time each day decreased after kefir intervention and increased after milk intervention. Some other studies also found a beneficial effect of both kefir and milk on stool consistency or there were no differences compared to the control group (Moreira et al., 2017; Maki et al., 2018), while some studies have shown a beneficial effect of kefir or other probiotics on stool consistency, with the effect being significantly different from the control group (Lee et al., 2018; Yoon et al., 2018).

Conclusions

We conducted one of the first studies comparing the effects of kefir and milk on zonulin levels and gastrointestinal symptoms in healthy asymptomatic individuals. We have shown that daily consumption of kefir could be an effective strategy for individuals with constipation and bloating problems. There is still a lack of solid evidence for the use of probiotics for most medical conditions.

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STAR-VITAL project: Factors for ensuring participation in health promotion programs

Natalija Rozman[1], Klemen Širok[2]

[1] National Institute of Public Health, Trubarjeva 2, 1000 Ljubljana, Slovenia
[2] University of Primorska, Faculty of Health Sciences, Polje 42, 6310 Izola, Slovenia
natalija.rozman@nijz.si; klemen.sirok@fvz.upr.si

Abstract

Introduction: To ensure sustainable and healthy jobs, the STAR-VITAL project encourages stakeholders to tackle the challenges of an aging workforce. Free of charge, we carry out individualized workplace wellbeing activities for employees and managers in companies. Participants are - in addition to other measures such as workshops, mentoring and coaching – also admitted into customized communication campaigns based on customer relations management (CRM) information platform, with aim to change their health related behaviour. This approach (with the internal name ePlatform), which is presented below, primarily addresses the general challenge of low levels of participation or active involvement of employees in workplace wellbeing programs. *Methods*: CRM systems are used to manage interactions with current and potential customers, using analysis of customer interaction history with a business to improve customer relationship with a focus on customer retention and encourage purchasing behaviour. The CRM based ePlatform enables advanced personalized web-based and mobile device communication, mobile surveying, GDPR form management, API data sharing, advanced user segmentation, and advanced monitoring and users' interests' statistics. The wealth of data generated by ePlatform also enables identification of factors related to the intensity of employee and company involvement in workplace wellbeing measures: work specifics, exposure to health risk factors, current lifestyle, company specifics, industry specifics, employee's health issues, demographic characteristics. *Results:* As the project runs in several waves, we present the results of the first group of 31 (out of 80) companies, which are represented by 74 managers, involved in the campaign. The campaign for management consists of nine activities, aimed at the development and successful implementation of a workplace wellbeing program. The use of the ePlatform so far

shows a 68% success rate (21 out of 31 companies are currently actively participating). With the help of analysis of variance, in the coming months we will identify those differences between individuals and companies that are related to the intensity of participation in campaigns and the implementation of planned activities. *Discussion and conclusions:* Proper use of ePlatform enables improved support and empowerment of workers and companies in changing workplace and behaviours, leading to improved care for their own health and prolongation of work activity. To maximize the impact, it is necessary to identify approaches, activities and/or factors that motivate those involved to participate and to change their health and wellbeing behaviour.

Keywords: responsiveness, participation, CRM, measures, health promotion

Introduction

Despite numerous guidelines, strategies, projects, platforms and measures in the field of workplace wellbeing, challenge remains how to awaken the interests of both workers and companies, as these measures do not bring immediate health or financial benefits. The reasons for this are multifaceted and reach both at the level of the employee (lack of interest, ignorance, poor relationship with the employer, ...), companies (inadequate organizational culture, values of management, absence of age management, …), narrower and wider social environment (social values, prevailing lifestyles and habits) and regulatory framework (absence of subsidies or tax incentives supporting workplace wellbeing) (Bal et al., 2011; Loeppke et al., 2013; WHO, 2020). In the STAR-VITAL project, we are aware of the need to develop new approaches and systems for more effective take-up and retention of employees in health promotion programs and healthy workplace measures, which are ultimately aimed at retaining an aging workforce.

In the STAR – VITAL project (https://www.star-vital.si/o-projektu) we help companies free of charge in establishing, adapting and integrating concrete measures to protect and promote the health and wellbeing of employees in order to ensure sustainable and healthy workplaces - especially for older employees (45+). Project activities are designed to enable an individualized application of measures and identification and awakening of the interests of both employees and managers. An important measure within the project is the ePlatform, which works through the internet or e-mail and is adapted for the use on mobile devices. ePlatform is an innovative approach to promote and monitor the introduction of workplace wellbeing programmes for workers and companies' management in the fields of ergonomics and movement, stress, communication, nutrition, managerial practices, sleep, absenteeism – presentism and age management (STAR-VITAL, 2020).

The purpose of this paper is to present the solution for more effective promotion of employee participation in workplace wellbeing programs by using appropriate IT solutions (ePlatform). We also present the factors that encourage or inhibit the participation and willingness of employees to change their behaviours, related to ensuring health at work.

Methods

The ePlatform is based on a CRM (customer relationship management) solution, which basically enables a modern marketing approach for communicating and influencing purchase related behaviour. CRM is the strongest and the most efficient approach in maintaining and creating relationships with customers (Juneja, 2020). If many previous approaches and measures implemented in Slovenia are based on pull approach, where the offered content passively waits for the potential interest of customers (e.g. Zrno zdravja, Čili za delo, ASI…), the ePlatform on the other hand additionally brings a push approach, in which employees segmented according to their identified needs are being actively persuaded, stimulated and encouraged with tailored communication campaigns to change their behaviour (ePrvak d.o.o., 2020).

The ePlatform enables: advanced personalized communication through the internet and mobile devices, surveying via mobile devices, management of GDPR forms, API data exchange, advanced user segmentation and advanced statistics for monitoring communication and user interests. The wealth of data generated by the ePlatform also enables the identification of determinants related to the intensity of workers' and companies' involvement in workplace wellbeing measures: nature of work, exposure to health risk factors, current lifestyle, company specifics, industry specifics, presence health problems, demographic characteristics, etc.

Results

In the absence of subsidies and direct financial incentives to employers or supportive legislation, employers are the ones who largely moderate what will happen to workplace wellbeing programs or/and older employees in the workplace. That is why the first activity within the ePlatform is the campaign aimed at a company's management. In the first wave, we included 31 companies out of the planned 80, represented by 74 employees in different managerial positions.

The campaign for company managers consists of nine e-mails, that recipients receive weekly. In case of their unresponsiveness (unread message), the user automatically receives an encouragement message with a reminder. The entire campaign lasts 56 days. The contents of the campaign follows the steps to the successful implementation of the workplace wellbeing program in the company: (1) presentation of steps in the process of establishing the workplace wellbeing program, (2) implementation of a screening questionnaire on the health of the company/employees, (3) identification of necessary measures

and good practices through the analysis of the screening questionnaire and introduction with the STAR-VITAL Wiki page (repository of 150+ known occupational health promotion and workplace wellbeing measures), (4) elaboration or supplementation of the existing health promotion plan, (5 and 6) adaptation of already implemented measures, (7) introduction of change management and (8) a system for monitoring the quality of the implementation of the workplace wellbeing in the company. In the last step (9), we encourage the company to celebrate the achieved goals on an ongoing basis.

The success rate of the campaign for the management at the time of writing (March 2020) reached 82% (23 active companies out of 28), while the latest results (July 2020) show a 68% (21 active companies out of 31). The current average share of read e-mail content in the campaign for managers is 60%. All STAR-VITAL measures are being evaluated by participants, ePlatform content including. In ePlatform users numerically evaluate the content on a scale from 5 (highest score) to 1. The current satisfaction rating of the received content for the managers is 4.5. It also needs to be mentioned that so far 25 companies or 869 employees have completed the screening questionnaire. We have already included many of them in campaigns in the field of physical activity and ergonomics, nutrition and stress.

Discussion

In the STAR-VITAL project, we encourage stakeholders (companies and employees) to actively promote occupational health and wellbeing through various channels. The greatest potential for constant communication and user promotion is the ePlatform, which our analysis also confirms. The results indicate a high share of user (company) activity, satisfaction with received content and a satisfactory level of content readability. Campaign performance varies in time (holiday leaves and events when emails are treated as SPAM). The situation related to COVID-19 also proved to be an important factor, pushing a significant part of companies to face the challenges of stopping their operations and production, which consequently meant a stalemate in workplace wellbeing activities.

Factors important for the successful introduction and implementation of occupational/workplace health promotion and wellbeing, have already been explored by numerous authors (Archer, 2012; Bakker, 2015; Spence, 2015; Schmid et al., 2017; Santos, 2019). In the STAR-VITAL project, based on the richness of data monitored by the ePlatform (CRM system), we will upgrade these studies and determine whether the readiness and level of active participation of stakeholders (employees, companies) are also influenced by other, less researched factors: line of business, management support in the implementation of health promotion, company specifics, demographic characteristics, personal values of health promoters and company management, awareness of expected benefits, perceived level of (health) problems in employees or personnel problems in the

company, etc. Analysis of variance and later also multilevel modelling will be used for the analysis.

Conclusions

Regardless of the fact that many activities in the field of workplace wellbeing are currently being carried out in Slovenia, their introduction and implementation in a practical environment is still a challenge. With the proper use of the ePlatform, we are on the way to provide greater support and empowerment for both employees and companies to change their behaviour at work (and outside work), which leads to greater care for their own health and prolongation of work activity. To make the impact even better, it is necessary to identify the approaches, activities and/or factors that motivate those involved to participate and change behaviour.

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Type 1 Diabetes Management Using Information Communication Technology

Eva Skočir, Tereza Sever, Tadeja Vidmar, Andrej Starc

University of Ljubljana, Faculty of Health Sciences, Zdravstvena pot 5, 1000 Ljubljana, Slovenia
eva.skocir05@gmail.com; tery.sever@gmail.com; tejci.vidmar@gmail.com;
andrej.starc34@gmail.com

Abstract

Introduction: The incidence of diabetes type 1 is increasing. Meanwhile, diabetes represents one of the greatest risks for comorbidity with other diseases and late complications associated with diabetes, thus a great burden for the health system. Diabetes complications occur more often if the disease is poorly managed. Type 1 diabetes is often diagnosed in children and young adults who represent a big part of the working population. *Methods:* We used the descriptive method with a systematic overview of scientific and professional literature. We searched through CINAHL, Medline, ScienceDirect databases. The key words we searched for were: diabetes type 1, information technology in healthcare, diabetes management, diabetes control, diabetes self-management, disease management, information communication technology and sladkorna bolezen tipa 1. We typed them into a search engine in various yet meaningful combinations in Slovene and English language. Hundreds of sources of literature have been found. Based on the suitability of the titles a selection was made. Furthermore, based on reading of abstracts, we decided to include 19 sources in preparation of the article. Inclusion criteria when deciding which sources to use were: sources published after 2014; resources that have full access online; available articles for free; professional and scientific literature only; Slovenian and English sources only. The literature search took place in the second half of February and the first half of March 2020. *Results:* Progress in the field of information and communication technology opens up possibilities for improved health care for patients with diabetes, which is a step toward easier and better diabetes management. Blood glucose monitors continuously measure blood sugar and transmit measurements to the apps on smartphones or directly to the insulin pumps. These pumps then connect to computers where a better overview of the blood sugar status is enabled. Various smartphone applications provide online consultation

and support for patients. This development creates greater chance for better patient-focused health care. New technologies offer opportunities to overcome barriers, such as geographical distance and lack of access to information that may occur regardless of the patient's age. *Discussion and conclusions:* Devices such as insulin pumps and various devices for continuous measurement of blood sugar are increasingly interconnecting with each other or with various programmes and applications on PCs and smartphones, therefore allowing individuals a better control of their blood sugar and helping healthcare professionals identify patterns and options in order to help the patient. Technology use is a tool that leads towards decrease of numbers of patients with diabetes complications. Consequently, a higher percentage of individuals that are capable of pursuing their profession are reducing the burden of health care, insurance companies and the state.

Keywords: type 1 diabetes mellitus, healthcare professionals, active working population, technology, diabetes complications

Introduction

The incidence of diabetes type 1 is increasing (NIJZ, 2020; WHO, 2020). Uncontrolled blood glucose level and uncontrolled diabetes as its consequence, lead to serious damages of various organ systems in the body, especially the nerves and blood vessels (WHO, 2020).

Type 1 diabetes is representing between 5 and 10% of all diabetes cases in the world. Type 1 diabetes occurs when the production of insulin is deficient. The cause, nor the means to prevent type 1 diabetes are not known. (Tauschmann and Hovorka, 2018; WHO, 2020). Diabetes type 1 is incurable, and lifelong management of the disease is required (Tauschmann and Hovorka, 2018). The management depends upon daily administrations of insulin, frequent blood sugar monitoring and calculating carbohydrate intake (Haslund-Thomsen et al., 2020). Regular glucose monitoring enables appropriate adjustment of the insulin doses and consequently higher chances to achieve normoglycaemia (Nana et al., 2019). Retaining blood glucose within the optimal level significantly reduces the risk of complications. Diabetes complications occur more often if the disease is poorly managed (Haslund-Thomsen et al. 2020). The treatment differs among patients. It depends upon one's habits and characteristics (Rodríguez-Rodríguez et al., 2018).

Diabetes type 1 is often diagnosed in young adults and children, that in time, represent a big part of the working population (Haslund-Thomsen et al., 2020). Meanwhile, diabetes represents one of the greatest risks for comorbidity with other diseases and late complications associated with diabetes, thus a great burden for the health system. The rising number of new cases has become a global problem that, besides public health and health systems, significantly affects also the economy and social development, causing health complications and consequently high costs of therapy (Cerna and Maresova, 2016).

Methods

We used the descriptive method with a systematic overview of scientific and professional literature. We searched through CINAHL, Medline, ScienceDirect databases. The key words we searched for were: diabetes type 1, information technology in healthcare, diabetes management, diabetes control, diabetes self-management, disease management, information communication technology and sladkorna bolezen tipa 1. We typed them into a search engine in various yet meaningful combinations in Slovene and English language. Hundreds of sources of literature have been found. Based on the suitability of the titles a selection was made. Furthermore, based on reading of abstracts, we decided to include 19 sources in preparation of the article. Inclusion criteria were: sources published after 2014; resources that have full access online; available articles for free; professional and scientific literature only; Slovenian and English sources only. We searched also on the official websites of WHO (World Health Organization) and NIJZ (Nacionalni inštitut za javno zdravje RS). The literature search took place in the second half of February and the first half of March 2020.

Results

In the past, the only option of managing the disease was manual checking of the blood glucose via finger picking and manual administration of the insulin, but in the last years technology has become an indispensable accessory in helping and easing self-management of the disease (Rodríguez-Rodríguez et al., 2018). Elementary way of applying insulin are insulin pens. In 1990s insulin pumps became widely available and brought a huge improvement in health care of patients with diabetes. Modernization of insulin pumps has enabled implementation of adjunctive technologies, such as bolus calculators and furthermore combining monitoring blood glucose and applying insulin with interconnected sensors of blood glucose, insulin pumps and diverse mobile applications that are rapidly gaining popularity in last years (Tauschmann and Hovorka, 2018). Even though the therapy with insulin pumps and other devices is on average more expensive than therapy with daily injections, the costs are in long term reduced from fewer diabetic complications that follow improved diabetes control (Beck et al., 2019).

Technology and glucose monitoring

- Blood glucose meters: smaller than in the past; testing blood glucose via finger picking.
- Continuous glucose monitors: provide up to 1440 measurements per day – one measurement per minute; are interconnected with mobile apps and insulin pumps or can transfer data to programmes on computer (Beck et. Al., 2019, Haslund-Thomsen et al., 2020; Rodríguez-Rodríguez et al., 2018).

Technology and insulin application

- Smart pens and mobile applications: Smart pens can connect with smartphone applications wirelessly and share data. Doses, time, bolus calculation and more can be saved in the app. Smartphone application nowadays offer recording of blood-glucose data, food intake, dose recommendations and tracking of physical exercise.
- Insulin pumps: connected to the patient with a tubing system; enabling continuous delivery of insulin, include bolus calculators; ability to programme multiple basal rates; can connect with a computer and send data to the programme; can connect with mobile applications; malfunctions of pumps and infusion sets may occur.
- Automated insulin delivery systems, often named artificial pancreas consist of continuous glucose monitor, an insulin pump, and an algorithm – using glucose concentration and previous insulin delivery data to regulate insulin delivery (Beck et al., 2019; Rodríguez-Rodríguez et al., 2018).

Progress in the field of information and communication technology opens up possibilities for improved health care for patients with diabetes, which is a step toward easier and better diabetes management (Nana et al., 2019).

Blood glucose monitors continuously measure blood sugar and transmit measurements to the apps on smartphones or directly to the insulin pumps. These pumps then connect to computers. Various smartphone applications provide online consultation and support for patients. This development creates greater chance for better patient-focused health care. New technologies offer opportunities to overcome barriers, such as geographical distance and lack of access to information that may occur regardless of the patient's age (Lanzola, 2016).

Telemonitoring improves control of blood sugar, helps to reduce HbA1c. There were found positive effects on associated diseases, such as hypertension, dyspnea, etc. patient empowerment and better quality of life (Andrès et al., 2019; Kitsiou et al., 2017).

Discussion

Use of ICT is enabling individuals a better control of their blood sugar and helping healthcare professionals identify patterns and options in order to help the patient. Technology use is a tool that leads towards decrease of numbers of patients with diabetes complications. Consequently, a higher percentage of individuals that are capable of pursuing their profession is reducing the burden on health care, insurance companies and the state (Dadgar and Joshi, 2018; Kitsiou, 2017; Krishnan and Selvam, 2019; Murillo, 2017; Offringa, 2018; Wu Y, 2017).

Only 20% of patients with diabetes type 1 do not keep any record. Paper documentation is most common among the patients that do keep record, and only 4% use mobile apps. Reasons for not using apps are: paper documentation preference, considering their use as a waste of time, or considering it too difficult. With the development of technologies, we can expect higher number of users in the future. Besides following blood glucose levels, the treatment of diabetes also involves monitoring one's weight, intake of carbohydrates, insulin dosage, and physical activity (Cerna and Maresova, 2016; Dinath and Mearns, 2019).

To be able to give proper advice about the apps and also type of device that would be the most suitable for a patient, specific information is required: the patient's personality, technical skills, daily regimen, attitude to diabetes, preferences in data visualization and functionalities, willingness to learn new things, and motivational means (Holubová et al., 2019).

Conclusions

It is necessary to emphasize the important role that diabetic patients have in the development of information and communication technologies. They need to be included in the innovation process, as they are the key actors, that can contribute to the development of health informatics in this field (Kanstrup, 2015).

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Distance teaching: perceived stress, psychological health and work satisfaction among classroom teachers

Janja Tekavc, Pia Novak

University of Maribor, Faculty of Education, Koroška cesta 160, Maribor, Slovenia
janja.tekavc@um.si; pia.novak@student.um.si

Abstract

Ninety-one Slovenian classroom teachers participated in a study and completed an online questionnaire about their perceived level of stress, wellbeing and work satisfaction during the period of distance teaching due to epidemic of COVID-19. The results revealed that teachers perceived similar amount of work-related stress during the period of distance teaching as in general classroom setting. The majority of teachers experienced none to minor symptoms of psychological distress due to distance teaching working conditions, and reported being predominantly satisfied with their work during the epidemic of COVID-19.

Keywords: COVID-19, distance work, teaching, psychological distress, wellbeing

Introduction

The pandemic of COVID-19 is presenting us with "uncertain times," in which the future of an individual as well as the whole society presents as unclear. The pandemic emerges as a stressful and even traumatic event that requires individuals to make sense of the new situation and choose appropriate coping actions. Psychological theories and research on stress and individual coping are of great relevance to understand individual responses and reactions to merging stressors associated with the COVID-19 pandemic (Guan et al., 2020).

The influence of the pandemic of COVID-19 has represented a career transition to many people (Rudolph and Zacher, 2020). During the epidemic of COVID-19, the majority of the Slovenian active population encountered a changed way of working. Among them were also Slovenian teachers who carried out distance teaching during the measures introduced in the fight against

the spread of the COVID-19 virus. Teachers' work is in general associated with increased level of stress, especially when teachers are exposed to many changes in the work process (De Simone et al., 2016). Research shows that teachers' perceived stress is consistently correlated with their wellbeing. Further, teachers' perceptions of stress and sense of wellbeing are central to their ability to teach well (MacIntyre et al., 2019).

The aim of this research was to assess the perceived level of current and general stress in classroom teachers during the period of distance teaching due to COVID-19, their psychological wellbeing, and the level of satisfaction with their work.

Methods

Participants and procedure

An invitation to an online questionnaire was sent to primary school teachers via social network groups (i.e., Facebook, Twitter) at the beginning of sixth week of online teaching, which represented the middle of the work-at-home period for teachers in Slovenia during COVID-19 epidemics. The online questionnaire was developed on previous qualitative data inquiry (i.e. interviews with several teachers) and included: demographic questions, information about the current level of perceived stress during distance online teaching, general stress during previous periods of teaching, current distress and psychological wellbeing markers, and satisfaction with life and work. Ninety-one Slovene female teachers completed an online questionnaire. The mean age of participants was 40.90 years (SD = 19.26) and the participants had a mean of 13.66 years of teaching experience (SD = 9.85).

Measures

We used the following measures: (1) Demographic and background information: participants' age, seniority in primary school teaching, the grade they currently teach, and the number of students they currently have in their class; (2) Perceived psychological stress: we used single-item measures of stress to capture the extent to which participants reported experiencing stress during the period of distance learning (i.e., current stress) as well as their typical level of stress during traditional classroom teaching (i.e., general stress); (3) Current distress symptoms: using scales that ranged from 1 (not at all) to 4 (very much), the participants reported the extent to which they were experiencing different psychological distress symptoms; (4) Work satisfaction: using a scale that ranged from 1 (not at all) to 5 (very much), the participants indicated the extent of their satisfaction with their current work and private life.

Statistical methods

General descriptive statistical analysis using the statistical program SPSS version 26 was used to evaluate the data. Paired samples *t*-tests were performed to examine differences between current and general stress with two-tailed tests of significance and confidence intervals being based on the level of $p < .05$.

Results

In the present study, participants reported very similar scores for current stress (M = 3.10, SD = 0.60) and for general stress (M = 3.11, SD = 0.50; t[91] = -0.86, p = .39).

Table 1: Teachers' experience of psychological distress symptoms during the period of distance teaching.

Psychological distress symptoms	*Frequency (%)*				*M*	*SD*
	1 - Never	*2 -Occasionally*	*3 - Often*	*4 - Very often / allways*		
Restlessness	14	49	19	17	2.4	0.93
Mouth dryness	41	44	9	6	1.8	0.85
Absence of positive feelings	48	34	12	5	1.7	0.87
Breathing issues	66	23	8	4	1.5	0.82
Lack of proactivity	54	35	10	1	1.6	0.71
Overacting	22	48	17	13	2.2	0.93
Shaking	76	14	8	2	1.4	0.72
Nervousness	28	38	19	15	2.2	1.02
Concern	51	35	8	6	1.7	0.87
Nothing to be happy about	59	27	8	6	1.6	0.89
Irritation	20	41	22	17	2.4	1.00
Tension, hard to relax	18	47	23	12	2.3	0.90
Sadness	31	43	15	11	2.1	0.95
Impatience	28	38	24	11	2.2	0.96
Anxiety	53	28	14	5	1.7	0.90
Lack of enthusiasm	58	28	9	5	1.6	0.86
Feelings of worthlessness	56	29	9	6	1.7	0.89
Oversensitiveness	19	40	30	11	2.3	0.91
Increased heart rate	48	31	17	3	1.8	0.86
Fear	44	38	14	4	1.8	0.85
Feelings of meaningless	78	13	5	3	1.3	0.73

Legend: M, mean; SD, Standard deviation

Table 1 presents different symptoms which usually appear with experiencing a psychological distress and the extent to which participants rated their observation of the occurrence of these symptoms among themselves during the period of distance teaching. On a scale ranging from 1 (not at all) to 4 (very much), the arithmetic means of the symptoms ranged from the minimum of

1.3 to the maximum of 2.4. The symptoms with the highest mean are indicated in the table.

Participants' level of satisfaction with different aspects of their work and private life during the period of distance teaching is presented in Table 2. On a scale ranging from 1 (very dissatisfied) to 5 (very satisfied), the arithmetic means of the dimensions ranged from the minimum of 2.6 to the maximum of 4.2. The participants indicated the highest level of satisfaction with quality of learning materials they provided for their students during the period of distance teaching, the availability of the working materials they needed for their work at home, and their communication with the students and their parents. They were least satisfied with the amount of time they dedicated for their work as well as for their private life.

Table 2: Teachers' level of satisfaction with work and life during the period of distance teaching.

Dimension	Level of satisfaction (frequency %)					M	SD
	1	2	3	4	5		
Quality of work	2	14	25	47	11	3.5	0.95
Teaching approach	3	15	30	42	10	3.4	0.98
Availability of working materials	0	2	8	65	25	4.1	0.64
Quality of learning materials	0	0	7	64	30	4.2	0.56
Private life	7	23	27	29	14	3.2	1.15
Time dedicated for work	20	34	21	21	4	2.6	1.16
Time dedicated for private life	19	34	18	23	7	2.6	1.21
Personal relationships	9	19	20	30	23	3.4	1.27
Partner and family support	3	7	13	46	31	3.9	1.00
Communication with co-workers	0	5	19	53	23	3.9	0.80
Communication with students and parents	0	3	20	49	27	4	0.78

Legend: M, Mean; SD, Standard deviation
Level of satisfaction … 1 – very dissatisfied, 2 – dissatisfied, 3 – not satisfied, not dissatisfied, 4 – satisfied, 5 – very satisfied

Discussion

The purpose of the present study was to investigate primary school teachers' perceived level of stress, wellbeing and satisfaction with their work and life during the period of distance teaching due to epidemic of COVID-19. The results revealed a similar level of perceived stress between general teaching setting and distance learning conditions. This is somewhat different from the study findings of the Slovene National Education Institute about distance education during epidemic of COVID-19 (2020), in which teachers reported perceiving distance teaching as stressful and demanding.

The majority of teachers in our study reported never or only occasionally experiencing different symptoms of psychological distress during the period of distance teaching. This is in line with some foreign studies (See, Wardle

and Collie, 2020) in which the majority of teachers reported being happy and cheerful, calm and relaxed during the period of distance teaching due to lockdown. Despite the fact that distance teaching was not connected to significant psychological distress for the majority of participants in our study, we found that among the most common symptoms of psychological distress were different signs of increased nervous tension (e.g., restlessness, nervousness, irritation, and inability to relax), which implies that for some teachers the whole situation of working at home was however demanding. The difficultness of this situation is probably connected not only to their changed working conditions, but also to changes in teachers' private home settings as a consequence of their confinement in their home because of the epidemic (e.g., taking care of their children's school work, having their spouse working at home in the same time).

In general, teachers in our sample reported being satisfied with their working conditions, private life, and social support they received during the epidemic of COVID-19. They seemed to be the most satisfied with the availability of materials they were able to reach by using information communication technologies (ICTs), the materials they provided for their students, as well as with their communication with students and their parents. We could argue that the situation with COVID-19 allowed the teachers to get acquainted with information communication technologies (ICTs) and strengthen their competencies in their use. Participants in our study appeared the least satisfied with the amount of time they dedicated for their work and private life, with spending too much time for their work and as a consequence being left with inadequate time for themselves. This supports the notion that the influence of the pandemic of COVID-19 has represented a career transition to many people (Rudolph and Zacher, 2020) including teachers, forcing them to face and invest time and energy to adapt to the new working demands.

This study offers a very important and current insight into teachers' coping with changed working conditions due to epidemic of COVID-19. However, some weaknesses can be identified, such as (1) small sample of participants; (2) participants were invited to participate via social networks, which could represent the fact that mostly of the teachers who are very skilled in using ICTs were involved in this study; (3) time of data gathering (i.e., sixth week of distance teaching) in which the majority of teachers might have already successfully managed the transition from face-to-face teaching to distance teaching.

Conclusions

In light with preparing for the possible upcoming outbreaks of COVID-19 and changed educational settings, this study offers some valuable insight into teachers' perceptions of distance teaching and its impact on their health and wellbeing. Despite representing a transition which required an active adaptation, the period of distance teaching due to epidemic of COVID-19 did not appear as a significantly stressful situation for teachers in our study. Participants

reported facing only minor or no psychological symptoms of distress and in general experienced satisfaction with their work and life during the pandemic. In order to more thoroughly investigate the impacts of distance teaching on teachers and design its optimal procedures, future research is needed, including larger and more representative sample of teachers, longitudinal approach, and other methods of inquiry (e.g., qualitative approach).

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Exercise at workplace: an overview

Nikola Todorović, Valdemar Štajer, Darinka Korovoljev, Nebojša Maksimović, Sergej Ostojić

Faculty of Sports and Physical Education, University of Novi Sad, Lovćenska 16, Novi Sad 21000, Serbia

nikolatodorovicl708@gmail.com; stajervaldemar@yahoo.com; nebojsam@uns.ac.rs; korovljev.darinka@gmail.com; sergej.ostojic@uns.ac.rs

Abstract

Introduction: Exercise programs may have a significant impact on worker(s) efficiency and the implementation of an exercise intervention at the workplace could be positively related to the reduction of unnecessary societal costs. The aim of this review is to systematically analyze the evidence from studies that examined workplace interventions which implemented physical exercise programs and subsequent impact on work performance and health. *Methods:* Research on available literature was conducted on PubMed (Medline) and Kobson database. Only randomized controlled trials (RCTs) including exercise or physical activity at the worksite were examined. *Results:* Following the review of the literature, we found 309 studies that included the keywords: exercise, workplace, health, intervention. After reading the abstract or full text, a total of 10 studies were included in the research. Most studies, five of them, based their interventions on resistance training and/or strength training, two studies examined the effects of flexibility exercises, while the remaining three studies examined the effects of several different types of training. The results of most studies indicated improvements in health, work productivity, and motivation. *Discussion and conclusion*: Altogether, studies retrieved for analysis in our review demonstrate that there is moderate to strong evidence to perform exercise at the workplace. The benefits depend on the length and the type of intervention. The evidence supports the use of short, simple exercise for workers at the worksite. Strength exercises have led to the greatest benefits. In terms of intensity, opinions are divided, but both moderate and high-intensity exercises appear to lead to improvements. Exercise length is estimated to be optimal for about 10-15 minutes per session.

Keywords: Exercise; Physical activity; Workplace exercise; Worksite exercise; Intervention; Health

Introduction

There is strong evidence that physical activity (PA) can prevent and have a beneficial effect on a wide range of physical and psychological disorders, along with the promotion of the longevity (Physical Activity Guidelines Advisory Committee, 2008). General recommendations of the World Health Organization (WHO) are 150 min of moderate-intensity at least, or 75 min of vigorous-intensity aerobic PA or equivalent of a mixture of these two activities. WHO recognizes well-being as an important marker of health and plays an important role in relationships between employee and employer, as well as job satisfaction and productivity. The problem in most developed countries is the increasing number of sedentary populations. Workplaces require less physical effort from workers as a consequence of technological development. In study of (Parry and Straker, 2013), it is shown that workers spend most of their time sitting, while in studies (Thorp et al., 2012; Wallmann-Sperlich et al., 2017) results shown that workers spend more than 70% of their working hours sitting. Physically active people obtain more physical and mental health benefits compared to sedentary people. (Pate et al., 1995; Hu et al., 2000). Around 70% of world population does not meet the minimum requirements for health-related physical activity. Physical activity is a leading risk factor (together with smoking, hypertension, and dyslipidemia) for cardiovascular diseases (Ostojić et al., 2013). Based on the fact that the most adults spend around 8 hours a day at their workplace, and that job as mentioned is based on sitting, offering physical activity programs at the workplace could be an efficient way to enhance levels of activity. Workplace exercise is a specific exercise program for workers, carried out at a worksite, with the aim of improving of the several general qualities of life outcomes as well as specific outcomes, such are muscle strength and flexibility (Dishman et al., 2009; Grande et al., 2014). These programs are important for improving the workability of employees and improving health in general. Poor operability is associated with loss in productivity, work disability and early retirement (Kuoppala et al., 2008). In this review article, the goal is to analyze current workplace interventions. The findings of this growing problem can help with improving future workout programs.

Methods

This paper reports on workplace-based exercise interventions, mostly based on strength and flexibility intervention. The main outcome of the reviewed intervention was to improve workability and health outcomes. The reviewer N.T conducted independently the article selection process. The reviewer screened the articles initially, based on the title and abstract, in order to determine whether the trial met the inclusion criteria. The full text was retrieved and reviewed in detail if the criteria were met. The approach of this systematic review was based on the PRISMA statement and the Cochrane handbook for systematic reviews of interventions (Higgins and Green, 2011). A systematic search of the literature was conducted on PubMed (Medline) and Kobson database. Arti-

cles with all data relating to exercise intervention at work were reviewed. Level 1 randomized controlled trials (RCTs) were included in the study. Also, information from other sources, in which the trials of the quality lacked, were included. The search was performed during January 2020. Only English language articles published in peer-reviewed journals were considered. Studies from January 2010 to January 2020 were analyzed to review findings from studies reflecting modern-day intervention and approaches. Studies were not excluded, because of any of the following factors: sex, the position at work, or age groups.

Results

The initial search for the literature detected 309 articles about workplace intervention; still, 299 were excluded after being determined that they are unrelated to workplace exercise interventions or failed to meet the inclusion criteria, or both. Total of 10 studies were included. Only randomized control trials were included. Most of the included studies contained either strength training or flexibility training. Total of 1590 subjects participated in these studies. The main goal of the interventions was to improve health and productivity. The characteristics of the analyzed studies are presented in (Table 1). Altogether, studies retrieved for analysis in our review demonstrate that there is moderate to strong evidence to perform an exercise at the workplace. The benefits depend on the length of the study and the type of intervention. The benefits depend on the length of the study and type of intervention.

Discussion and conclusion

Walking is considered to be the form of physical activity most widely accepted in the masses. It is one of the most basic physical activities. All the people spend most of their lives walking, anyway. The idea of the study (Torrente et al., 2017) was to determine the effects of active break at work and walking in the park and their effect on the stress and blood flow. The idea of reducing cortisol, as a stress hormone with walking in the park, was supported by previous studies which stated that walks in natural surroundings had lower cortisol values compared to urban walks (Lee et al. 2011). An interesting study (Jakobsen et al., 2017) examined the impact of exercise with colleagues at worksite versus exercise at home. The result of their study indicated the greater benefits of exercise at worksite. The subjects felt better and were more energetic after the intervention. These results were in agreement with previous research of Dugdill and colleagues (2008). This might be the result of the greater commitment to the exercise program and the influence of the social factor. The earlier study by the same group of researchers (Jakobsen et al., 2015) found that group exercise with colleagues during work prevents operability deterioration. Svensson and colleagues (2009) demonstrated that a 14-month prevention program, that combined physical training, patient transfer techniques, and stress management reduced self-reported sickness absence compared to a control group. It is very interesting question about which type of physical activity could have

Table 1: The characteristics of the analyzed studies

Study	*Journal*	*Year*	*Subjects sex*	*Age Mean*	*Intervention*	*Study type*	*Duration*	*No. of sub.*
Andersen and Zebis	Inter.Jour. of Rheumatology	2014	Male and Female	44	Elastic resistance training five times a week for 15 and 2 min.	RCT	10 weeks	132
Sundstrup et al.	Scand. Jour. of work, environment & health	2014	Male and Female	45; I 41; C	I- 10min of strength training for the upper body C- ergonomic training	RCT	10 weeks	66
Torrente et al.	Scand. Jour. of Work and Organizational Psychology	2017	Male and Female	NR	I-15 minutes of relaxation exercise or park walking; C- none	RCT	4 weeks	153
Kettunen et al.	Inter. Jour. of Occupational Med. and Environmental Health	2015	Male and Female	45; I 41; C	I-Supervised training at 60-80% Vo_{2max} one time per mouth + 3-5 unsupervised trainings; C-none	RCT	1 year	371
Grande et al.	Einstein	2014	Male and Female	25; I 29;C	15min of stretching exercises	RCT	12 weeks	20
Hartfiel et al.	Scand. Jour. of Work, Environment & Health	2010	Male and Female	40; I 38; C	I- 60min Yoga 1-3 times a week; C- None	RCT	6 weeks	48
Ting et al.	Inter. Jour. of environmental research and public health	2019	Male and Female	41	I-ergonomics and neck / shoulder; strength exercise; C- health promotions	RCT	12 weeks	350
Jakobsen et al.	BMC public health	2017	Female	42	I-5x10min Home- 5x10min C- none	RCT	10 weeks	200
Jakobsen et al.	BMC public health	2015	Female	42	I :5x10min C:5x10min	RCT	10 weeks	200
Wollseiffen et al.	Stress and Health	2016	Male and Female	42; I 40;C	1- bike ergometer; 2- boxing; 3- massage chair; 4-control/none	RCT	NR	50

Legend: RCT - randomized control trail; NR - not reported; WE - Workplace exercise, Home - Exercise at home; I - Intervention group; C - Control group

the most effects. There are, of course, many factors that could affect this. The study of (Wollseiffen et al., 2016) examined how different types of activities influence work performance and decision-making tasks. The results indicate that it might be possible that higher intensity activities had a bigger impact on these parameters. This theory is also supported by the study of (Sperlich et al., 2018) in which interruption of prolonged sitting with 6-min session of HIIT, induced more evident circulatory and metabolic responses and improved certain aspects of perception. On the other hand, many authors believe that moderate-intensity could lead to employee health benefits. The studies (Kettunen et al., 2015; Hartfiel et al., 2011) have examined the impact of light and moderate-intensity exercise. Such interventions indicated to influence the reduction of the stress. Moderate intensity is easier to apply to beginners, and longer adherence to the training program with this intensity may be achieved. Simple short training is well accepted among workers, but we must not prescribe physical exercise patterns by default. Musculoskeletal disorders represented the most common work-related health problem. In most of the review studies, we had strength exercise interventions. This exercise is by far the most effective in preventing any musculoskeletal disorders. In the study (Sundstrup et al., 2014) sixty-six randomly assigned workers with pain in upper-limb and work disability, exhibited of either strength training of upper body in 10 weeks (3 times per week, 10 minutes per session) or ergonomic training. Implement of strength training at the workplace, prevented deterioration of operability, chronic pain and disability. Workers with neck pain improved workability after the 12-week intervention of strength training (Ting et al.,2019). Stretching at worksite could be an effective way of improving workability and decreased pain. Unfortunately in the study of Gradnde et al. (2014), they didn't find any statistically significant evidence, maybe due to a small sample size and uncontrolled adherence to exercise. In order to curb exercise volume, we need to take into account individual preferences to increase motivation and long-term adherence (Anderson and Zebis, 2014). Approximately 10 min may be an optimal duration of exercise programs. The overview showed moderate evidence of past interventions. It provided insight into possible future solutions when designing an exercise program at work. The results of the studies analyzed are inconsistent, but it could be established that the strength exercises and high-intensity exercise interventions showed stronger effects on worker health and productivity. Exercise at work should be encouraged, in brief, but the effective boost of strength and flexibility training.

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