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HOW EMOTIONS INFLUENCE THE PSYCHOPHYSICAL WELL-BEING OF CHILDREN*

Introduction: The current work, through a strict review of the literature, is aimed at highlighting how emotions, physical activity and a healthy diet can affect psychophysical well-being in childhood, particularly between the ages of 3 and 12.
Research Aim: An analysis of research and texts on the relationship between emotions, nutrition, physical activity in pre-school- and school-aged children was performed. The article focuses on an in-depth bibliographic research through the most important search engines by analyzing scientific protocols/articles published from 2010 to 2022 in international journals of the sector.
Evidence-based Facts: Research is presented on the extent to which emotions can influence psychophysical wellbeing in developmental age including the relationship between emotions and physical activity activity, emotions and nutrition, physical activity and nutrition.
Summary: The ability to regulate emotions is of particular importance as it affects the child's educational process, the school context and physical, emotional, cognitive and social well-being. To this end, further investigations are needed to investigate this issue, given the great value it has in the interaction with nutrition and physical activity.

Keywords: emotion, emotion regulation, physical activity, healthy nutrition, childhood.

INTRODUCTION

Emotional education was born as an answer to a series of needs that arise in today's society, like, for example: anxiety, depression, behavioral problems, food disorders

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(Fernández-Berrocal and Extremera, 2010). By enhancing the body dimension and the playful-sporting games, the richness and extraordinary nature of human nature emerges, analyzing and underlining the relationship between body, emotion, movement and cognition, which for too long has been neglected due to a historical-philosophical heritage that derives from the dualism of Cartesio (Lo Piccolo, 2019). The WHO (2010) recommends performing at least one hour of physical activity a day and emphasizes its benefits for health, disease prevention, education of children and young people through various motor experiences.

The emotions, if properly regulated, improve social interaction and individual well-being (Renzetti and Tripicchio, 2010). Recently, the literature is emphasizing the critical role of difficulty in regulating emotions (Fairburn et al., 2003; Haynos and Fruzzetti, 2011; Lavender et al., 2015; Oldershaw et al., 2015; Pisetsky et al., 2017) and of emotional processing (Sfärlea et al., 2016) that is played in the symptomatology of eating disorders. Research has shown that parents exert a great influence on their children's eating (Savage et al., 2007).

Stress has also been linked to unhealthy emotional eating behaviors and an unbalanced dietary pattern (Dallman et al., 2003; Adam and Epel, 2007; Macht, 2008). Poor nutrition and physical inactivity are the key contributors to obesity and are the leading causes of death among young people, chronic disease and economic health costs (Friedemann et al., 2012; Hamilton et al., 2018). A healthy diet characterized by an adequate and balanced nutritional intake can guarantee proper physical, cognitive and emotional growth, but also a feeling of satiety and sufficient physical capacity (Kim and Cha, 2021).

An increasing number of studies have shown how physical activity can have a significant effect on brain structures and psychosocial and cognitive functions in healthy children and adults, but also in those suffering from various neurological and psychiatric conditions (Vorkapic-Ferreira et al., 2017).

A particular situation that deserves attention is the one concerning the COVID-19 pandemic that has affected the whole world. Researches conducted in China and Europe revealed that children in isolation are physically less active, have irregular sleep patterns and eat unhealthy diets, all of which result in weight gain and loss of cardiorespiratory fitness (Cachón-Zagalaz et al., 2020; Jiao et al., 2020; Jiloha, 2020; Pietrobelli et al., 2020; Wang et al., 2020).

RESEARCH AIM

The objective of this study is to explore and deepen the role of emotions in the developmental age and how they can positively influence the psychophysical sphere of the child but also what relationships exist between emotions and physical activity, emotions and nutrition, physical activity and nutrition, for well-being. The

careful and scrupulous analysis of the research selected and analyzed demonstrates how emotions and their regulation are able to influence the physical, emotional and cognitive state of children. Furthermore, it is essential to reflect on how a healthy diet combined with constant physical activity can help students acquire correct and healthy lifestyles. Focusing on emotions will promote academic success, classroom behavior, self-esteem, self-image, satisfaction with school, sense of belonging and social interaction. However, further research will be needed to deepen this issue given the great and important value that it has in children and beyond.

The selection was made through search engines such as the University Library System website of the Carlo Bo University of Urbino. Subsequently, investigations were also launched through the EBSCO database, through which the following databases were consulted: APA PsycArticles, APA PsycInfo, Audiobook Collection (EBSCOhost), eBook Business Collection (EBSCOhost), eBook Collection (EBSCOhost), eBook Open Access (OA) Collection (EBSCOhost), EconLit with Full Text, Environment Complete, ERIC, GeoRef, GeoRef In Process, MEDLINE, MLA Directory of Periodicals, MLA International Bibliography with Full Text, Open Dissertations, Philosophers Index with Full Text, Political Science Complete, Psychology and Behavioral Sciences Collection, SPORTDiscus with Full Text.

The parameters used were: "emotion" or "emotions" or "emotional" and "physical activity" or "physical education" or "sports" and "healthy eating" or "healthy diet" or "healthy nutrition" or "healthy food" and "children" or "childhood" or "kids" or "early years". The systematic review examines publications between the years 2010 and 2022 that have addressed this topic.

Exclusion criteria: age target that included samples of adolescents and adults, studies conducted in a period prior to 2010 or written in languages other than English and Spanish, research aimed at purely clinical populations and studies not in line with the objective. Following the exclusion of duplicates and irrelevant results, a total of 33 articles were examined.

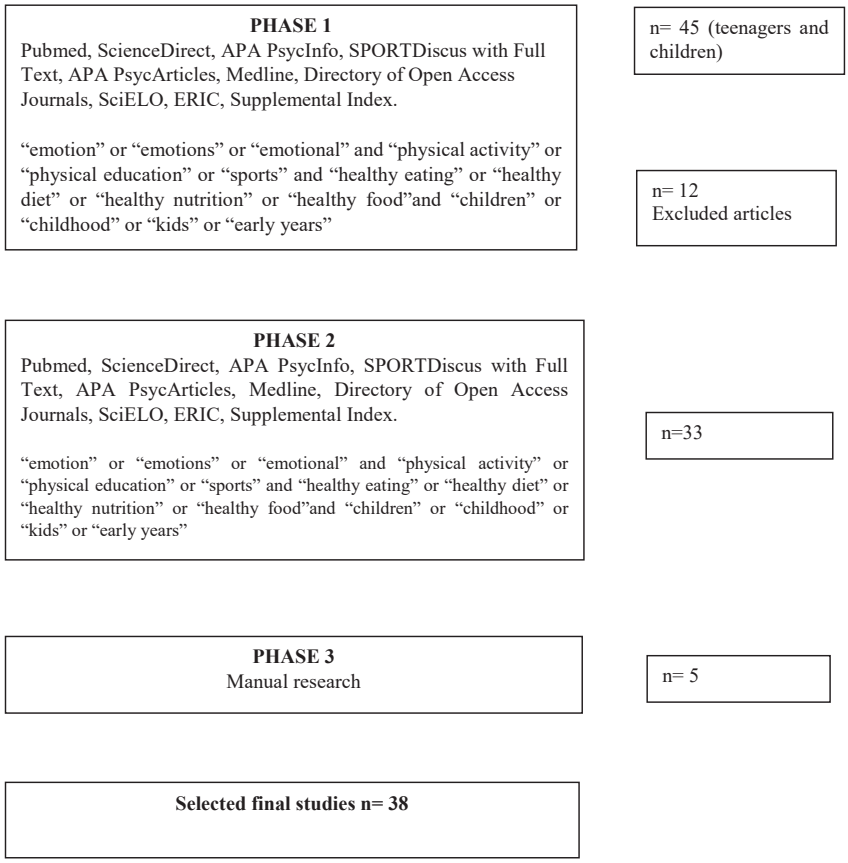
The last step of manual research was carried out, encouraged by the reading and deepening of the articles previously included, thanks to which 5 articles were found and added. At the end of the research, 38 total studies were valid, the sample of which was made up of children between the ages of 2–3 and 12, therefore, concerning the kindergarten and primary school.

The risks of bias have been considered and mitigated:

- publication bias: numerous scientific publications have been taken into consideration, with results that often confirmed the authors' initial hypothesis, but sometimes they have been partially confirmed. Most of the studies analyzed a medium/high sample of participants,
- time lag bias: the scientific publications that have been included in this systematic review include a wide time range that goes from 2010 to 2022. In this way we tried to avoid selection bias,

- language bias: scientific publications are written mainly in English, only some in Spanish. They have been selected by the main search engines and published in scientific magazines of the sector.

Figure 1.
Flow chart of the research phases



Source: Authors' own study.

EVIDENCE-BASED REVIEW

The results of the investigations conducted (Table 1) show how emotions and their regulation are able to influence the physical, emotional, cognitive and mental well-being of children. This well-being is in turn influenced by the relationship played by emotions related to physical activity and children's nutrition, but also by the relationship between proper physical activity and healthy nutrition.

Thanks to the study by Coskun and Oksuz (2019) conducted on 28 10-year-old samples of which, 16 assigned to the experimental group, it emerged that the ELT (emotional literacy training) program increased the emotional intelligence performance of students in the experimental group and it is a permanent increase. Mohorić et al. (2021) found that subjects included in the experimental group (N = 293) improved their scores in both post-treatment measures. Emotional understanding improved steadily over time, and was measured with both the Emotional Vocabulary Test and the Emotional Understanding Test. The effect of maturation was slightly more visible in girls. The importance of body-kinesthetic intelligence in infants was also examined in this review. The study performed by Di Iorio and Gomez Paloma (2015) shows that age can influence the development of motor skills and the execution of practical activities. At the same time, a research conducted by De la Cruz Ordoñez and Cruzata Martínez (2017) aimed to evaluate how a physical education learning path guides didactic and educational work to develop emotional and kinesthetic intelligence as an essential part of training of the student. The results showed that 40.13% of the students surveyed had a low level of emotional intelligence, while 88.76% showed a good/high level of body-kinesthetic intelligence. Of the teachers involved, only 27% recognize the role of physical education for the development of emotional intelligence. Furthermore, a study conducted by Escuza Mesías et al. (2021) investigated how bodily-kinesthetic activity could influence the cognitive development of the child. The results that emerged from the practices performed made it possible to highlight and contribute to the development of learning through the activity examined, together with the presentation of a physical and cognitive program.

The study conducted in 2020 by Cañabate et al. sought to analyze students' perceptions of skills and abilities that fostered awareness of emotions while performing introjective motor practices. From the pre-test and post-test results on 90 subjects investigated aged 9–10 years, significant differences emerged with a 20.1% improvement in the three dimensions of intrapersonal emotional attention after carrying out these practices in the classroom. Second, there was an 8.1% difference in post-test results for girls. This study shows how introjective practices provide primary school students with the tools with which to deal with the different problems they encounter on a daily basis, both of a motor and emotional nature. The study by Marouli et al. (2016) confirms that exercising children's ability to move and interact in a competent and rewarding way increases the possibility of developing a physically active and emotionally stable personality. The experimental group attended a psychomotor program for eight weeks. The latter significantly improved their motor skills but none of the participants showed a significant benefit with regard to self-concept. It probably takes a longer period to get results for this aspect. Palumbo's (2020) study aimed to evaluate the psychomotor process

and cognitive-adaptive functions in relation to physical activity. The results confirmed the strong connection between sports practice and psychomotor and cognitive development. Indeed, low levels of cognitive-adaptive functions are sometimes predictors of possible school learning disorders and/or problems.

In the following review, the relationship between emotions and nutrition was also investigated. From the investigations it emerged that the study by Graziano et al. (2010) aimed to investigate the role of self-regulation including: emotion regulation, sustained attention and inhibitory control / reward sensitivity in predicting pediatric obesity in early childhood. Participants were faced with tasks. The results showed that children with poor ability to regulate emotions and less ability to inhibit control / greater sensitivity to reward had a higher probability of being overweight or/at risk at the age of 5.5 years. The concept of emotional eating was addressed through three studies. The experimental study by Blissett et al. (2010) examined the relationships between the emotional feeding of preschool children and parental feeding practices. Experimental manipulation of the child's mood and food intake in a laboratory setting was used. The children of mothers who use food to regulate emotions consume sweeter and more palatable foods in the absence of hunger. The study by Steinsbekk et al. (2018) confirms the mutual relationship between emotional feeding and emotional eating in 4-year-olds. The study by Stone and colleagues (2022) found that the parental use of food to regulate children's emotions mediated the relationship between parent and children's emotional eating. Using food as a reward and/or limiting it for health reasons partially mediated this relationship. Studies conducted by Braden et al. (2014) and by Vollmer (2019) seek to investigate the relationship between parental eating styles and the emotional eating of offspring. From the research of Braden et al. (2014) found that parental emotional feeding practices may be related to emotional eating in children. Additionally, treatment with overweight champions who engage in emotional eating can be improved by targeting parental feeding practices. Instead, Vollmer's (2019) study sought to determine whether parents' eating styles might influence the relationship between parenting eating practices and children's preferences for fruits, vegetables, or high-fat/sugar foods. The research shows that the relationships between the child's preferences for vegetables, foods high in fat and/or sugars and the four eating practices of the parents (authoritative, authoritarian, indulgent, uninvolved) have been altered by their eating style. The eating behaviors of children can also be influenced by factors such as stress, in fact, the research conducted by Michels et al. (2012, 2015) sought to investigate the relationship between stress and children's eating/dietary behavior, but also how it affects lifestyle. With the 2012 study it was highlighted how stressful events, negative emotions and problems are positively linked to emotional eating by observing positive associations between problems and the consumption of both sweet and fatty foods. Instead, negative associations were found between stressful events and fruit and

vegetable consumption. Thanks to the following study we can affirm that stress is connected to an emotional diet and a more unhealthy eating pattern and this could favor the development of overweight even in children. However, emotional eating behavior did not affect the relationship between stress and dietary patterns as it was not associated. The same author conducted a survey in 2015 in which he tried to examine the two-way relationship between stress and lifestyle. The work was carried out on 312 5–12-year-old samples. In children, stress-related aspects were measured using questionnaires on events, negative emotions and behavioral problems. The following lifestyle factors were evaluated: physical activity (using accelerometers), sleep duration, food consumption (sweet foods, fatty foods, snacks, fruits and vegetables) and eating behavior (emotional, external, content). It turned out that the relationships were mainly one-way: stress stimulated nutrition in the absence of hunger which could facilitate overweight. Therefore, families should realize that stress can affect their children's diet and problem management skills should be acquired. Contrary to what had been hypothesized, stress could also stimulate physical activity in younger people as a positive way to cope with it. Michels et al. (2017) wanted to study the role of leptin in the association between stress and emotional nutrition/diet in children. The survey confirmed that the stress represented by emotional problems and elevated daily cortisol seems to lead to hyperleptinemia only in girls. The combination of high stress and hyperleptinemia could make girls more vulnerable to eating.

The following research was carried out in evaluating how the interaction between healthy physical activity and proper nutrition affect the child's well-being. Jansen et al. (2013) and Halasi et al. (2018) tried to investigate the relationship between obesity and health-related quality of life. The study shows that for 6–7-year-old subjects this is the most critical period, in which the comorbidities between HRQoL-BMI emerge and strengthen, first among those who have clinically relevant conditions (overweight or low HRQoL) and then more generally in the entire range of BMI. Poor HRQoL seemed primarily a consequence of a higher BMI, rather than a cause, suggesting that effective promotion of a healthy weight could benefit numerous aspects of developmental well-being. Instead, the study by Halasi et al. (2018) conducted on 182 7–8-year-old investigators calculated both BMI and body fat percentage (BFP) and HRQoL was assessed. The survey showed that obesity at that age could negatively affect some aspects of HRQoL, above all, obese children could have poor social support and peer functioning. Obese ones face numerous adverse psychosocial difficulties. This aspect is deepened through the study by Esposito et al. (2014). The sample population consisted of 148 obese (experimental group) and 273 healthy (control group) children. Weight, height and BMI *z*-score were calculated in all children examined. The Children Depression Inventory (CDI) and the Italian Self-Administered Psychiatric Scales for Children and Adolescents (SAFA) were administered. The results showed that the

obese subjects showed a significantly higher level of depressive symptoms and SAFA-A total scale score than the control group. There were no significant differences between males and females in the levels of depression and anxiety in the obese group. Pearson's correlation analysis showed a significantly positive relationship between BMI *z*-score and CDI and SAFA-A score. The study by Eiffener et al. (2019) assesses emotional and behavioral problems before and after an obesity intervention and examined the relationships between changes in the child's behavior and weight status. The authors confirm that the emotional and behavioral problems of the children improved after the surgery. Additionally, the findings suggest that obesity treatment can help reduce emotional distress in preschool age. Well-being in developmental age is also influenced by the quality of the diet as shown by the following studies. McMartin et al. (2012) conducted a prospective study to examine the relationship between diet quality and mental health of 10–11-year-old subjects which found that dietary variety rather than excessive food consumption may reduce the risk of developing internalizing disturbances. The same author carried out research in 2013 to evaluate the relationship between diet quality and feelings of worry, sadness and unhappiness in Canadian children. The results showed that diet plays a role in feelings of worry, sadness or unhappiness, and these findings complement other studies that have suggested the link between diet and mental health. López-Gil and García-Hermoso (2022) also explored the association between subjective well-being (SWB) and adherence to the Mediterranean diet (MD). In addition, they sought to determine possible specific eating patterns of this diet that could be associated with SWB among pupils. The study was carried out on a sample of 1,490 Chileans aged 8–12. Research showed that greater adherence to MD, as well as fruit/juice and dairy (at breakfast), were related to life satisfaction and positive affection. Consequently, the promotion of a healthy dietary model (e.g. MD) may be relevant to improve several domains of subjective well-being, even in non-Mediterranean individuals. Studies have confirmed that a balanced diet benefits cognitive development with improvements in school performance. Teisen et al. (2020) performed a study on 199 children aged 8–9 years. The latter were randomly assigned to receive ~300 g/week of fatty fish or poultry (control group) for 12 ± 2 weeks. The research shows that fatty fish improved cognitive function in a dose-dependent manner, especially for attention and cognitive flexibility, and decreased socio-emotional problems. Khan et al. (2015) evaluated cross-cutting associations between performance on an attention inhibition task and dietary fatty acids, fiber, and overall diet quality in children aged 7 to 9 years ($N = 65$). The study shows that diet quality is positively correlated with the ability to flexibly modulate cognitive control when activity demands increase. Additionally, low dietary fiber intake is associated with poorer performance in a task that taps into the prefrontal cognitive control function. Vassiloudis et al. (2014) wanted to explore the possible links between adherence to the Mediterra-

nean diet, excess body weight, energy balance behaviors and school performance in Greek Primary School pupils. Students completed a specially designed energy balance behavior questionnaire along with the KIDMED index. The teacher assessed academic performance through a 5-scale questionnaire. Standard anthropometric measurements were also made. The research found that poor adherence to the Mediterranean diet, obesity and low levels of physical activity appear to negatively affect school performance. Haapala et al. (2017) investigated the association between a healthy diet in grade 1 children as assessed by Mediterranean Diet Score (MDS), Baltic Sea Diet Score (BSDS) and Finnish Children Healthy Eating Index (FCHEI) with academic achievement in those of grade 1–3. The results confirm that a healthier diet rated by BSDS or FCHEI in grade 1 was associated with better reading skills, but not with arithmetic skills, among grade 1–3 students. Why they do not improve arithmetic skills is still unknown. Studies have shown that physical activity also improves cognitive development and academic results. The project by Cadenas-Sánchez et al. (2016) aims to examine the effects of a 20-week exercise program on brain structure and function, cognitive performance, school performance, and physical and mental health in overweight/obese individuals. The sample consisted of 50 children representing the exercise group and 50 control ones. The intervention consisted of 3–5 sessions per week of 90 minutes each, and was mainly focused on high intensity aerobic exercises, but also included muscle strengthening exercises. In a sub-sample, the extent to which the effect of the intervention persisted 8 months after the end of the exercise program was also studied. The study found that the combination of selected primary and secondary outcomes included in this project will provide new insights into the multidimensional benefits of exercise on the health of young people. Bekhechi and Khiat (2019) conducted a research on a sample made up of 110 subjects in developmental age. The experimental group ($N = 55$) benefited from 3 weekly sessions of extracurricular physical and sporting activity, while the control group did not practice any extracurricular physical and sporting activity. The study found that students who play out-of-school sports have general school averages and a higher level of intelligence than students who do not, and sports girls have significantly higher overall school averages than sports boys. As is known by many similar studies, the practice of regular physical and sporting activity appears to have a positive impact on academic performance and cognitive functioning. From the research of Erwin et al. (2021), whose purpose was to test kinesthetic learning theory on students' emotions through the use of the Walking Classroom (WC) learning platform, we can infer that offering active learning appears to make students feel happier, healthier and smarter. In 2022, Wick et al. evaluated the relationships between physical stability and attention and its individual size. Additionally, they aimed to find physical endurance components (i.e. static balance, muscle strength, power, and coordination) that predict the variance of attention in a convenience sample of

healthy preschoolers. The results show that physical performance, especially coordination, is linked to attention in preschool age. Hence, high performance in complex fitness components (jumping on one leg) tends to predict attention in younger learners.

The research conducted by Gallè et al. (2020) evaluated the effectiveness of the AulAttiva program in increasing physical activity during school hours, comparing the levels of it objectively measured in a group of pupils (intervention group) involved in the program with those of control. As a secondary objective, it was analyzed whether the program generated different responses in terms of physical activity levels between non-overweight and overweight/obese subjects. The results support the effectiveness of CABs in increasing BP during the school day. Greater effects were recorded among pupils of normal weight, suggesting the possible influence of weight status on the participation of children in the intervention.Tkac et al. (2017) wanted to investigate how to implement a program to promote health in school age through physical activity and healthy eating aiming at sustainability and continuity. The participants were 1,098 students, aged between 6 and 10 years. The latter belong to two schools: experimental school (N = 592) / control school (N = 506). The project was carried out in 2013 (pre-test) and was followed until 2015 (post-test), with an intervention in 2014. Based on the implementation of a school program for health promotion, through physical activity and healthy eating, it can be concluded that it is possible, sustainable and practicable to maintain constant actions in the school environment, aiming at the education of healthy habits and strengthening the pillars of health promotion. The implementation and sustainability of this program in the school environment must be structured in an intersectoral way, involving the managers of the health and education sector, the community (students, parents, teachers and school management) in which everyone can actively and consensually participate to the trial. The results confirm that long-term interventions promote positive and significant changes in the profile of school health indicators.

Finally, well-being in developmental age was strongly influenced by the COVID-19 pandemic. Philippe et al. (2021) evaluated the possible changes in the feeding behaviors of the children, in the feeding practices and in the motivations of the parents when they buy food during the lockdown compared to the pre-pandemic period. The study confirmed that when changes occurred, children's appetite, food enjoyment, responsiveness and excessive emotional consumption of food increased significantly during the block. The increase in boredom in the subjects significantly predicted greater responsiveness, emotional overeating, and increased frequency of snacking between meals. However, by changing their practices, parents have generally become more permissive, frequently buying pleasant and sustainable foods, preparing home-cooked meals and cooking more with their child. The level of education and the increased level of stress predicted changes in paren-

tal practices and motivations. The study by Berasategi Sancho et al. (2021) analyzed physical, emotional, social and scholastic well-being during the lockdown in 2–12 year old Spaniards. The results suggest that general well-being during the lockdown was at an intermediate level. The lowest ones were obtained for physical activity, along with creative and playful ones. Girls, children and those with access to an outdoor space showed the highest levels of well-being.

Basterfield et al. (2022) aimed to assess one-year changes in fitness, health-related quality of life (HRQoL) and body mass index (BMI) during the 2020 lockdown period in the UK. Data were collected (October 2019, November 2020) from 178 samples aged 8 to 10 years. Significant changes were observed including: increases in mean BMI, overweight/obesity, SBJ and HGS; a decrease in 20 mSRT and sit-and-reach performance. Several children at follow-up were classified as "very low" for 20 mSRT performance. The increase in BMI *z*-score was associated with a decrease in the HRQoL of "physical well-being". Participation in sports clubs provided both physical and HRQoL-related benefits. Burkart et al. (2022) examined the obesogenic behaviors of children during the spring and summer of the COVID-19 pandemic compared to previous data collected on them during the same period in the previous 2 years. The results showed that compared to pre-pandemic measures in children, physical activity, sedentary behavior, sleep, screen time and diet worsened during the pandemic.

SUMMARY. DISCUSSION OF RESULTS AND CONCLUSIONS

With the analysis of the protocols of the systematic review, we tried to establish how emotions, physical activity and proper nutrition could be connected to each other in order to bring benefits to the well-being of the child.

As demonstrated by Cañabate et al. (2020), physical education offers an advantageous environment for the acquisition of emotional skills. Movement, especially during childhood, is a fundamental element for growth and development. In fact, our body is the concrete means that allows us to be present, to express our intentions and to represent the communication and connection we want to establish with others (Palumbo, 2020).

In investigating the relationship between emotions and nutrition in children of developmental age, an important role has been attributed to the self-regulation and use of food by parents as a tool for regulating emotions in their children. From a cognitive and didactic point of view, research has confirmed that physical activity and proper nutrition can bring numerous benefits to children. It seems that this activity can have a positive effect on academic success but also on other areas such as: behavior in the classroom, self-esteem, self-image, satisfaction with school, the feeling of belonging to it and social interactions. Research has shown that regular

physical activity improves students' academic achievement and productivity, as well as their ability to concentrate for long periods (De Greeff et al., 2018).

The strong point on which we should focus is the regulation of emotions as it affects the child's educational process, the school context and physical, emotional, cognitive and social well-being. To this end, further investigations are needed to investigate this issue, given and demonstrated the great value it has, also, on the interaction with nutrition and physical activity. The characteristics of the studies analyzed, including objectives, activities and results, are highlighted in Table 1.

Table 1.
Selected studies relating to how much emotions can influence psychophysical well-being in developmental age taking into consideration the relationship between emotions and physical activity, emotions and nutrition, physical activity and nutrition

Author / Year / Search engine	Number of children / Age / Duration / Setting	Activity	Results
Blissett et al. (2010) Pubmed	25 mother-child dyads Age 3–5	Completion of questionnaires on food practices (mothers). Mood manipulation and subsequent measurement of snack consumption in the absence of hunger (children)	Children of mothers who use food to regulate emotions eat more cookies and chocolate
Graziano et al. (2010) Pubmed	57 children Age 2–5.5	The children were taken to the laboratory and had to do some homework	Self-regulatory abilities in childhood were predictive of both normal developmental changes in BMI and pediatric obesity
McMartin et al. (2012) Pubmed	3,757 children Age 10–11	The Diet Quality Index-International was calculated on the basis of the students' responses to the YAQ and the Canadian Nutrient Files	Diet quality was not significantly associated with internalizing disorder. Children with greater variety had lower rates of this disorder in later years
Michels et al. (2012) ScienceDirect	437 children Age 5–12	Collection of data on subjects' emotional eating behavior and dietary patterns	Stressful situations and negative emotions have been positively associated with emotional eating. In these situations there is a greater consumption of sweet and fatty foods. Negative associations between events and fruit and vegetable consumption. Emotional eating behavior was not observed to mediate the stress-diet relationship
Jansen et al. (2013) Pubmed	3,898 children Age 4–5 and 10–11	With each wave, the parents completed the Pediatric Quality of Life Inventor. BMI was measured	Overweight was initially associated across the board with health-related quality of life at 6–7 years of age and a higher BMI developed at 8–9 years and strengthened at the age of 10–11

Author / Year / Search engine	Number of children / Age / Duration / Setting	Activity	Results
McMartin et al. (2013) Pubmed	6,528 children Age 10–11	The HFFQ questionnaire and theEQ 5D-Y	Diet quality was inversely associated with feelings of worry, sadness, or unhappiness. The variety and appropriateness of it were correlated with a lower likelihood of feeling worried. The effect of diet on these feelings was more pronounced in girls
Braden et al. (2014) ScienceDirect	106 mother-infant dyads aged 8–12	Completed – self-reporting measures of their children's emotional eating behavior, feeding practices, and symptoms of depression and binge eating (mothers) – self-reporting measure of their mothers' parenting style	Parental emotional feeding practices can be related to emotional eating in children. Treatment with overweight children can be improved by starting with the eating practices of the parents
Esposito et al. (2014) APA PsycInfo	148 obese children: experimental group Mean age 8.9 ± 1.23 273 healthy children: control group Mean age 9.1 ± 1.8	Weight, height and BMI *z*-score were calculated. CDI and SAFA were administered	The obese showed a higher level of depressive symptoms and anxiety than the control group
Vassiloudis et al. (2014) APA PsycInfo	528 children Age 10–12	Questionnaire on energy balance behaviors together with the KIDMED index (students). Evaluation of academic performance with a 5-scale questionnaire	Adherence to the MeD, obesity, physical activity levels, sleep hours, television viewing and global self-esteem levels are significant factors in predicting academic performance in Primary School children
Di Iorio and Gomez Paloma (2015) SPORTDiscus with Full Text	77 students Age 6–10	Individual tests and administered in the classroom (60 min). Difference between the tests according to the class they belong to	Possible existence of a correlation between the cognitive abilities of the child in age and his ability to perform conscious and coordinated movements
Khan et al. (2015) SPORTDiscus with Full Text	65 children Age 7–9	Screening for neurological disorders, physical disabilities, psychoactive treatment status and normal vision. Collection of data on intelligence quotient, socioeconomic status and pubertal status	Diet quality was positively correlated with the ability to flexibly modulate cognitive control as activity demands increased. Low fiber intake associated with poorer performance in a task that tapped into prefrontal cognitive control function

Author / Year / Search engine	Number of children / Age / Duration / Setting	Activity	Results
Michels et al. (2015) APA PsycArticles	312 children Age 5–12	Questionnaires on events, negative emotions and behavioral problems. Evaluated: physical activity, sleep duration, food consumption and eating behavior	Aspects of stress have increased physical activity, sweet food consumption, emotional, restrained, and external eating. Maladaptive eating behaviors increased feelings of anxiety
Cadenas-Sánchez et al. (2016) Medline	100 children (50 control group) Age 8–11	The intervention was focused on high intensity aerobic exercises, but also included muscle strengthening exercises. In one subsample, the extent to which the effect of the intervention remained 8 months after the end of the exercise program was investigated	The combination of primary and secondary findings provide new insights into the multidimensional health benefits of exercise for young people
Marouli et al. (2016) SPORTDiscus with Full Text	29 children (14 experimental group) Age 3.5–5	The experimental group attended the psychomotor program	The experimental group improved their motor skills between the two measurements. Neither group showed significant improvement in their perceptions of themselves
De la Cruz Ordoñez and Cruzata Martínez (2017) Directory of Open Access Journals	600 students (175 random sample children) Age 10–11	Emotional intelligence test carried out in the classroom for 20 min. The written kinesthetic test was applied in the classroom, the practical one in the school yard, both for 30 min. The teacher interview was coded separately	40.13% of the investigated sample showed a low level of development of emotional intelligence, while 88.76% showed a good/high level of kinesthetic body intelligence. Only 27% consider physical education responsible for the development of emotional intelligence
Haapala et al. (2017) SPORTDiscus with Full Text	161 children Age 6–8	Dietary factors assessed using 4-day food records and were calculated: MDS, BSDS, and FCHEI. Academic performance assessed by reading tests, reading comprehension and arithmetic skills tests	MDS was positively associated with reading comprehension in grade 3 students. BSDS was positively associated with reading ability in grades 2–3 and reading comprehension in grades 1–3. FCHEI was positively correlated with reading ability in grades 1–2 and reading comprehension in grades 1–3. None of the diet scores were associated with arithmetic skills
Michels et al. (2017) Pubmed	308 children Age 5–10 years at baseline 7–12 years to follow up	The association of fasting serum leptin with reported stress, that as measured by salivary cortisol, emotional nutrition, and frequency of food consumption was examined	A stress marker was significantly correlated with high leptin levels, but only in girls and in cross section. Leptin is not a significant predictor of unhealthy food consumption

Author / Year / Search engine	Number of children / Age / Duration / Setting	Activity	Results
Tkac et al. (2017) SciELO	1,098 children (592 of the experimental school) Age 6–10	It was evaluated: nutritional status, blood sugar level, cardiorespiratory endurance, passion for exercise and 4 categories of food	Differences between the experimental and control group in the years 2013 and 2015. It can be concluded that the intervention was effective
Halasi et al. (2018) Pubmed	182 children Age 7–8	In the sample examined, the BMI and BFP were calculated and the HRQoL was evaluated	The BFP analysis showed a higher score in normal weight boys than obese ones in the Social Support & Peers domains, while in girls there were no significant differences between weight categories and any HRQoL size
Steinsbekk et al. (2018) Pubmed	801 children Age 4 years and followed at 6–8–10	SDQ questionnaire. They were also performed 2–4–6 years later	Mutual relationship between emotional feeding and emotional eating in middle childhood
Bekhechi and Khiat (2019) SPORTDiscus with Full Text	110 children (55 experimental group) Age 6–10	The experimental group benefited from 3 weekly sessions of extracurricular physical and sporting activity	Practicing constant physical and sporting activity appears to have a positive impact on academic performance and cognitive functioning
Coskun and Oksuz (2019) ERIC	28 children (16 experimental group) Age 10	ELT activities have been designed for self-awareness, self-regulation, motivation, empathy and social skills	The ELT increased the emotional intelligence performance of students in the experimental group and this increase remained permanent
Eiffener et al. (2019) APA PsycInfo	77 obese children Age 4–6	Height and weight measured at baseline and 12 months later. Parents assessed their children's behaviors through CBCL. Conducted 10 weekly 90-minute sessions	The child's emotional and behavioral problems improved after the obesity treatment
Vollmer (2019) Pubmed	108 parents of children aged 3–5	Parents filled out questionnaires. Linear regressions were used to examine the relationships between parental eating practices, feeding style, and children's preferences	Parent feeding styles were found to be moderators between different parenting eating practices and the food preferences of the offspring
Cañabate et al. (2020) ERIC	90 students Age 9–10	Implementation of the six introjective practices	The pre- and post-test results showed significant differences with a 20.1% improvement in the three dimensions of intrapersonal emotional attention after performing a series of introjective practices in the classroom. There were no gender differences (pre-test). Significant changes were found in the post-test results for girls with a difference of 8.1%

Author / Year / Search engine	Number of children / Age / Duration / Setting	Activity	Results
Gallè et al. (2020) Medline	115 children (58 intervention group) Age 8–9	The AulAttiva program is based on the introduction of the CAB during school hours. The program included two periods of CAB in each school day, with the exception of one that involved physical education or outdoor activities. Each session lasted 5 min. and included 4 exercises: basic motor skills, light aerobic activity, light strength activity, and gross motor coordination	Light physical activity was greater in the experimental group. Within the non-overweight children, the experimental group spent less time in sedentary behaviors and more time in light physical activity. No differences between the overweight/obese subgroups
Palumbo (2020) SPORTDiscus with Full Text	281 children Age 6–8 years of which: 81 children playing sports 91 who do not play sports 109 who did not send the questionnaire	Information questionnaire completed by parents. Administration of the APCM-2 test within the same school buildings, in prepared environments	The observation of all three groups shows a clear improvement in psychomotor development between the first and second year of primary school
Teisen et al. (2020) Pubmed	199 children Age 8–9	Children were randomly assigned to receive ~300 g/week of fatty fish or poultry (control group) for 12 ± 2 weeks	Fatty fish improved cognitive function in a dose-dependent manner, especially for attention and cognitive flexibility, and decreased socio-emotional problems
Berasategi Sancho et al. (2021) ScienceDirect	1225 children Age 2–12	Survey compiled by parents to analyze the well-being of children (physical, emotional, social and academic)	The general well-being during the lockdown was at an intermediate level. The lowest levels were obtained for physical activity, for creative and playful ones. Girls, children and those with access to outdoor space showed higher levels of well-being
Erwin et al. (2021) ERIC	100 children Age 9–11	WC podcasts are audio lessons of approximately 20 min. based on content delivered via individual WalkKits that students listen to as they walk briskly (preferably outdoors)	Students reported feeling happy, healthy, educated, intelligent and excited as they walked and learned. On days when they couldnot go for a walk, they reported feeling bored, sad, sleepy and tired
Escuza Mesías et al. (2021) Supplemental Index	8 students Age 4–10	The technique of in-depth interviews with industry experts was applied. Use of questionnaires based on open questions and cross-examination	The results made it possible to highlight and contribute to the development of learning through the kinesthetic activity of the body, together with the presentation of a physical and cognitive program

Author / Year / Search engine	Number of children / Age / Duration / Setting	Activity	Results
Mohorić et al. (2021) MEDLINE	565 children (293 experimental group) Age 10–12	The EL program consisted of eight words/emotions. Compilation of questionnaires by all participants, performed at the end of the program and after 6 months	The experimental group improved scores in both post-treatment measures. Emotional understanding has steadily improved over time, as measured by both the VET and TEU tests. The effect of maturation was slightly more visible in girls
Philippe et al. (2021) ScienceDirect	498 parent-child dyad Age 3–12	Online survey. Parents referred to (the child's) current situation during the block, and retrospectively to the period before it	There have been changes in children's eating behaviors, feeding practices, and motivations for purchasing food. The increase in childhood boredom predicted an increase in reactivity, emotional overeating, and the frequency of snacking between meals. As parents changed their practices, they became more permissive. The level of education and increased stress predicted changes in parental practices and motivations
Basterfield et al. (2022) SPORTDiscus with Full Text	178 children Age 8–10	The performance of the 20-meter shuttle run test, grip strength (HGS), standing long jump (SBJ), sit and reach, height, body mass, HRQoL and participation in sports clubs were measured BMI *z*-scores and overweight/obesity	An increase in mean BMI, overweight/obesity, SBJ and HGS, a decrease in performance of 20 mSRT and sit and reach. More subjects at follow-up were rated "very low" for the performance of 20 mSRT. The increase in BMI *z*-score was associated with a decrease in the HRQoL of "physical well-being". Sports club participation in follow-up was associated with improved 20 mSRT performance
Burkart et al. (2022) APA PsycInfo	231 children, of which 74 are subsample Age 7–12	Through Fitbit Charge-2 collected data on physical activity and sleep for 6 weeks during the spring and summer for 3 years. The parents reported the time spent in front of the screen and the dietary intake of the child through a survey on 2–3 random days of the week	Compared to pre-pandemic measures, the subjects' physical activity, sedentary behavior, sleep, screen time and diet worsened during the pandemic
López-Gil and García-Hermoso (2022) APA PsycInfo	1,490 children Age 8–12	Qualified researchers measured the study variables and outcomes under standardized conditions. Questionnaires filled in by children	The study showed that greater adherence to MD as well as fruit/juice and dairy (at breakfast) intake were related to life satisfaction and positive affect

Author / Year / Search engine	Number of children / Age / Duration / Setting	Activity	Results
Stone et al. (2022) Pubmed	244 mothers of children aged 3–5	Questionnaires on Parent's Emotional Eating, Eating Practices, Emotional Eating, and Children's Temperament	Emotional eating by children can result from interrelationships between: increased emotional consumption by parents, use of food as a reward, restriction of food for health reasons, and negative affective temperaments. Furthermore, increased consumption of emotion-regulating food may predict an increase in the child's emotional eating regardless of temperament
Wick et al. (2022) Pubmed	61 children Age 4–6	In the subjects, the components of physical endurance were assessed and attention was measured	Physical performance, specifically, coordination is linked to attention in preschool. Hence, high performance in complex fitness components tends to predict attention in younger children

Source: Authors' own study.

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JAK EMOCJE WPŁYWAJĄ NA SAMOPOCZUCIE PSYCHOFIZYCZNE DZIECI

Wprowadzenie: Niniejsza praca, poprzez ścisły przegląd literatury, ma na celu zwrócenie uwagi na to, jak emocje, aktywność fizyczna i zdrowa dieta mogą wpływać na samopoczucie psychofizyczne w dzieciństwie, szczególnie w wieku 3–12 lat.
Cel badań: Przeprowadzono analizę badań i tekstów na temat relacji między emocjami, odżywianiem, aktywnością fizyczną dzieci w wieku przedszkolnym i szkolnym. W artykule skupiono się na dogłębnym przeszukaniu bibliografii w najważniejszych wyszukiwarkach poprzez analizę protokołów/artykułów naukowych opublikowanych w latach 2010–2022 w międzynarodowych czasopismach branżowych.
Stan wiedzy: Zaprezentowano badania dotyczące tego, w jakim stopniu emocje mogą wpływać na dobrostan psychofizyczny w wieku rozwojowym z uwzględnieniem zależności między emocjami a aktywnością fizyczną, emocjami a odżywianiem, aktywnością fizyczną a odżywianiem.
Podsumowanie: Zdolność regulacji emocji ma istotne znaczenie, ponieważ wpływa ona na proces edukacyjny dziecka, kontekst szkolny oraz dobrostan fizyczny, emocjonalny, poznawczy i społeczny. Wykazana interakcja emocji z odżywaniem i aktywnością fizyczną wskazuje na konieczność dalszych analiz empirycznych w tym zakresie.

Słowa kluczowe: emocje, regulacja emocji, aktywność fizyczna, zdrowe odżywianie, dzieciństwo.