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Vol. 8, n.º 1; p. 19-39, January 2022. <https://doi.org/10.17979/sportis.2022.8.1.8671>

## **Impact of formative assessment on weight status and dietary quality in primary schoolchildren**

### **Impacto de la evaluación formativa en el estado de peso y calidad de la dieta en escolares de primaria**

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**Editorial timeline:** Article received 26/08/2021 Accepted: 11/12/2021 Published: 01/01/2022

<https://doi.org/10.17979/sportis.2022.8.1.8671>

#### **To cite this article use the following reference:**

Carrillo-López, P.J.; Hortigüela-Alcalá, D. (2022). Impacto de la evaluación formativa en el estado de peso y calidad de la dieta en escolares de primaria. *Sportis Sci J*, 8 (1), 19-39.  
<https://doi.org/10.17979/sportis.2022.8.1.8671>

**Authors' specific contribution:** The authors have participated equally in the work.

**Funding:** There was no funding for this project.

**Informed consent study participants:** Informed consent was obtained.

**Conflict of interest:** The authors report no conflict of interest.

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### Abstract

Formative assessment is considered to be the engine of learning. Therefore, the aim was to analyse the relationship between weight status and diet quality with the formative assessment of the physical education teacher. This was a descriptive cross-sectional study on a sample of 122 schoolchildren. Two questionnaires were used: *teacher performance associated with formative assessment practices* and the *KIDMED* questionnaire. Nutritional status was assessed using the *Body Mass Index* ( $\text{kg}/\text{m}^2$ ). The differential analysis showed no significant differences in formative assessment practices considering weight status ( $p \geq 0.05$ ), diet quality ( $p \geq 0.05$ ) or the interaction of both ( $p \geq 0.05$ ). Bivariate or partial correlations analysis showed no significant relationship between *Body Mass Index* and mean diet quality score with formative assessment practices ( $p \geq 0.05$ ) with the exception of proactive formative assessment and diet quality ( $p < 0.05$ ). Also, multivariate regression analysis found that being normal weight or overweight and having optimal diet quality were associated with a higher likelihood of having a proactive formative assessment ( $R^2 = 0.155$ ;  $p < 0.05$ ). In conclusion, PE teacher's assessment practice does not appear to be related to weight status or diet quality; with the exception of proactive assessment.

### Keywords

Health; formative assessment; primary education; childhood; nutrition.

### Resumen

La evaluación formativa es considerada el motor del aprendizaje. Por tanto, el objetivo fue analizar la relación existente entre el estado de peso y la calidad de la dieta con la evaluación formativa del docente de Educación Física. Se trata de un estudio descriptivo transversal sobre una muestra de 122 escolares. Se utilizaron dos cuestionarios: *desempeño docente asociado a las prácticas evaluativas formativas* y el cuestionario *KIDMED*. Por su parte, el estado nutricional se valoró mediante el *Índice de Masa Corporal* ( $\text{kg}/\text{m}^2$ ). El análisis diferencial no mostró diferencias significativas en las prácticas evaluativas formativas considerando el estado de peso ( $p \geq 0,05$ ), la calidad de la dieta ( $p \geq 0,05$ ) o la interacción de ambos ( $p \geq 0,05$ ). Por su parte, el análisis de correlaciones bivariadas o parciales no arrojaron ninguna relación significativa entre el *Índice de Masa Corporal* y la puntuación media de la calidad de la dieta con las prácticas evaluativas formativas ( $p \geq 0,05$ ) a excepción de la evaluación formativa proactiva y la calidad de la dieta ( $p < 0,05$ ). Asimismo, el análisis de regresión multivariado detectó que estar en normopeso o sobrecarga ponderal y tener una calidad de la dieta óptima se asocia con una mayor probabilidad de tener una evaluación formativa proactiva ( $R^2 = 0.155$ ;  $p < 0.05$ ). En conclusión, la práctica evaluativa del docente de Educación Física no parece estar relacionada con el estado de peso o la calidad de la dieta; a excepción de la evaluación proactiva.

### Palabras clave

Salud; evaluación formativa; educación primaria; infancia; nutrición.

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## Introduction

The treatment that has traditionally been attributed to the body in educational institutions has been reduced to the motor field through the teaching of a curricular discipline, Physical Education (PE), which has been characterised as a mechanistic and technical subject, influenced by the hegemonic rationalist culture that predominates in Western society (Águila & López, 2019). Seeking to break this paradigm, this manuscript points out that it is currently important to 'incorporate' theoretical and practical progress on embodiment into PE, with the aim of achieving a meaningful holistic approach to education, as well as breaking with the more traditional approaches to the body that are still in place in the educational sphere and are reproduced through this educational subject.

In this way, only by being clear about what the aims of PE are can we begin to establish with clarity and priority what the current challenges of PE are and what professional competences PE teachers should have. In this sense, the main challenge at present continues to be the development of quality, well-founded and coherent educational practice (López-Pastor et al., 2016). In view of these principles, improving students' bodily competence for health, understood as the ability to use and care for our body appropriately, enjoy and express ourselves with it, requires new approaches in the teaching-learning process, both in terms of methodological innovation and content (Carrillo-López et al., 2021). In this way, the figure of the teacher acquires new prominence, and even more so if we take into account the results achieved in the *Programme for International Student Assessment* (PISA) external report, which states that teachers play an essential role in student learning (OECD, 2019). As a result, teacher assessment and the requirement of certain competences in the effectiveness of their professional work is beginning to be a question that needs to be addressed since the assessment applied by teachers is an indicator of the quality of PE teaching (Baena-Extremera et al., 2015) and even more so, if the educational administration in Spain finally increases to three hours of PE in the whole of compulsory education.

One of the main reasons for this possible increase in the timetable is to improve lifestyle and reduce the alarming levels of overweight in children and young people (Pérez-Pueyo et al., 2021). Obesity is currently classified as a disease in itself and as the great epidemic of the 21st century, representing an unprecedented public health problem. Specifically, if the current trend

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continues, an estimated 3,100,000 new cases of overweight are expected for the period 2016-2030 in Spain, entailing a direct medical cost overrun of around 3,000,000,000,000 euros per year (Hernández et al., 2019). In recent weeks, obesity has also been linked to the COVID-19 pandemic, with evidence suggesting that some biological and social factors associated with obesity confer a higher risk of COVID-19 infection, hospitalisation and greater severity compared to normal weight individuals (Rubio & Bretón, 2020). This study points out that obesity undoubtedly leads to a low-grade pro-inflammatory state that results in dysregulation of the immune system, compromising its ability to respond to respiratory infection with COVID19 and leading to a worsening of the disease.

Furthermore, diet quality (DQ) has been identified as a key risk factor for non-communicable disease (NCD) epidemics as chronic intake of a diet high in advanced protein glycation products (AGEs) is associated with an increased risk of NCDs, particularly diabetes and obesity. This manuscript states that to reduce their intake it is recommended, among other strategies, to minimise the intake of ultra-processed foods rich in AGEs and to adhere to a "Mediterranean" diet and healthy hydration, rich in phytochemicals, and sustainable (Castillo & Iriondo, 2020). For its part, the World Health Organisation in 2020 considers inadequate nutrition to be a global public health problem and has included it in the Sustainable Development Goals for its significant reduction by 2030 (Bull et al., 2020).

Different approaches to food education coexist, although all of them coincide in pointing to the school as a strategic early intervention setting given the age range of the sample; there is generally great resistance to changing eating habits, especially when these have crystallised in adulthood (González et al., 2020). Similarly, these authors point out that the educational experiences of food education carried out by teachers themselves on the basis of conventional teaching parameters, often based on the textbook as the sole resource, lack the potential for the practical transfer of learning. Thus, in this study, the project-based approach to food education in primary school, based on proposals based on real problems related to the daily experience of pupils, is positioned as a framework for action with great potential for the treatment of food education, as it brings together significance for pupils, social relevance and curricular relevance. However, this quality learning can be negatively affected by poor

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curriculum planning or ineffective assessment design (Chiappe et al., 2016) due to various factors such as lack of time or experience (Azpilicueta, 2020).

Traditionally, a summative assessment system has been used in the educational process, where students are graded and classified in order to comply with the bureaucratic demands of the educational administration (Herranz & López, 2017). However, over the last few decades, this trend has been reversing and proposals are becoming increasingly widespread that understand assessment as a formative activity linked to learning, with the aim of acquiring a series of knowledge and in which students play an active role in the teaching-learning process (Córdoba et al., 2018). In turn, this study has shown that there is a need to apply formative assessment processes in PE classes given their positive relationship with motivation, satisfaction and adherence to healthier lifestyles. In this sense, given that evaluation is one of the aspects that determines the entire teaching-learning process, it is a process that should be subject to analysis (Otero et al., 2020). Based on these precedents, the aim of this study was to analyse the relationship between weight status and diet quality with the schoolchildren's perception of the formative assessment applied by the PE teacher after completing a project-based learning situation (LS) in primary schoolchildren.

## Materials and methods

### Participants

A total of 122 schoolchildren (64 boys and 58 girls) from the Autonomous Community of the Canary Islands (South of Tenerife), aged between 10 and 12 years ( $M \pm SD$ :  $10.84 \pm 1.20$  years) participated in this empirical descriptive and cross-sectional ex post facto study. Sampling was non-probabilistic, non-random and convenience sampling (access to the sample). A public school in the district of Adeje was selected. This school has a medium-high socio-economic level. In previous meetings held with the headmistress of the school and legal guardians of the schoolchildren, they were informed of the study protocol and informed consent was requested so that the schoolchildren could participate. The work team consisted of a principal investigator and four collaborators who were teachers specialising in Primary Education and Physical Education. In addition, two of them are career civil servants with PhDs in education. Inclusion criteria were age 10-12 years and regular school attendance (90% of

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classes during the months of the current academic year). In addition, the following exclusion criteria were used: 1) Failure to provide informed consent to participate in the research.

### **Procedure and instruments**

The work was carried out during the months of February and March of the 2020/2021 academic year. The head of the school and the representatives of the parents' associations were informed of the purpose and protocol of the research at a meeting. A theoretical session was held prior to the completion of the questionnaires with each study group in order to ensure that all participants understood the questionnaires for this study. The research team administered the test in the natural class groups in the PE class.

The questionnaires and measurements were carried out in the first teaching session of the following day after the end of an 18-session LS aimed at improving the nutritional habits of schoolchildren around the following constructs; I) food and nutrition; II) misleading advertising, miracle diets, fitness and sugar; III) physiological consequences of unhealthy eating for human beings and; IV) environmental conservation. Recycling. The methodology used in this LS was project work, as it allows for proposals based on real problems related to the students' daily experience (González et al., 2020).

It should also be noted that during the two months that the LS lasted, formative assessment was carried out in all its dimensions by the teachers. That is, proactive formative assessment (e.g., before working on an activity, written instructions were given with what was to be achieved in the task); interactive (e.g., when working on an activity, the teacher reviewed the work to give immediate feedback); metacognitive (e.g., when formatively assessing through the use of the task, the teacher gave the student the task instructions); and metacognitive (e.g., when formatively assessing through the use of the task, the teacher gave the student the task instructions and the teacher gave the student the task instructions). When assessing formatively through open-ended questions or problem solving, the reason or why the answer was given); retroactive (e.g., when answering incorrectly, the teacher helped to find the correct answer through other questions that guide to the solution); and finally, adjusted and associated with marking (e.g., when a test was given, a brief note was written on the test itself explaining the main errors and difficulties).

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The research was developed following the deontological standards recognised by the Declaration of Helsinki (2013 revision), following the recommendations of Good Clinical Practice of the EEC (document 111/3976/88 of July 1990) and the current Spanish legal regulations governing clinical research on humans (Royal Decree 561/1993 on clinical trials).

### *Causal variable*

The questionnaire: teaching performance associated with formative assessment practices (Cerón et al., 2020) was used to assess the student's perception of the teacher's formative assessment practices. This instrument is composed of 21 items grouped into six sub-scales. Each sub-scale refers to formative assessment associated with grading (summative) (items 1-3), proactive formative assessment (items 4-6), interactive formative assessment (items 7-10), metacognitive formative assessment (items 11-14), retroactive formative assessment (items 15-18) and adjusted formative assessment (items 19-21). The overall scale score is obtained from the average score obtained for each subscale. The higher the score, the higher the level of formative assessment practices of the teacher. The response alternatives were through a Likert-type scale where: 1=Never and 5=Very Frequently. The estimated response time was 20 minutes. The psychometric analyses carried out on this formative assessment questionnaire at classroom level corroborated the degree of reliability of this instrument ( $\alpha$ : 0.90).

### *Criterion variables*

The quality of the Mediterranean diet was measured using the KIDMED questionnaire (Serra et al., 2004). This instrument is composed of 16 items representing standards of the traditional Mediterranean diet. Four of them are scored negatively (-1 point) in case of affirmative answers (items 6, 12, 14 and 16), while the remaining twelve items are scored positively (+ 1) in case of affirmative answers. After summation, an overall score between -4 and 12 is obtained, which describes a better or worse quality of the diet. The value of the KIDMED index is: score  $\leq 3$  indicating a very low quality diet; score between 4 and 7 indicating the need to improve the dietary pattern to fit the Mediterranean model; and finally, score  $\geq 8$ , showing an optimal Mediterranean diet.

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Weight and height were determined using an electronic scale (TANITA TBF 300A, USA) and measuring rod (SECAA800, USA) with an accuracy of 100 g and 1 mm respectively, following the protocol of the International Society for the Advancement of Kynanthropometry (ISAK) with level I certified personnel. From these anthropometric variables, the body mass index (kg/m<sup>2</sup>) was calculated. From this index, age- and sex-adjusted nutritional status was diagnosed (Cole & Lobstein, 2012). Participants were categorised into two groups: normal weight and overweight (overweight + obesity).

### Statistical analysis

Normality and homogeneity of variances were obtained using the Kolmogorov Smirnov and Levene statistics, respectively. As a normal distribution of the recorded values was observed, a parametric analysis was chosen. Differences in teachers' formative assessment practices according to gender (*male vs. female*), weight status (*normal weight vs. overweight*) and diet quality (*improvable vs. optimal*) were tested using the Student's t-test. Effect size was calculated using Cohen's *d* (0.20 = small; 0.50 = medium; and 0.80 = large effect). Differential analysis of the combined weight status/diet quality variable resulting in four groups (*normal weight/optimal DQ, normal weight/improvable DQ, overweight/optimal DQ, and overweight/improvable DQ*) was studied using a simple analysis of variance (one-way ANOVA; Bonferroni post hoc test). Effect size was calculated using  $\eta^2$  (0.01 = small; 0.06 = medium; and 0.14 = large effect) (Cumming & Calin, 2016). Finally, it was decided to perform a multinomial logistic regression to observe the probability of obtaining different outcomes depending on whether students are overweight/improvable DQ. The data analysis was carried out using the IBM SPSS 25 statistical programme, with the significance level set at 5% ( $p \leq 0.05$ ).

### Results

Table 1 shows the teacher's formative assessment practices considering and disregarding gender. Significant differences were found only in *Body Mass Index* in favour of males ( $p < 0.05$ ).

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**Table 1.**

*Teacher formative assessment practices with and without regard to gender*

	Men M ± SD (n = 64)	Women M ± SD (n = 58)	F	p	d
Formative assessment associated with the (summative) rating (3-15).	9.75 ± 2.49	8.96 ± 2.85	1.673	0.107	0.15
Formative assessment proactive (3-15).	11.61 ± 2.42	11.67 ± 2.45	1.370	0.898	0.08
Formative assessment interactive (4-20).	15.13 ± 3.10	15.21 ± 3.31	1.632	0.884	0.07
Formative assessment metacognitive (4-20).	15.00 ± 2.95	14.02 ± 4.04	6.003	0.127	0.15
Formative assessment retroactive (4-20).	15.13 ± 3.03	15.40 ± 3.33	1.266	0.632	0.09
Formative assessment adjusted (3-20).	10.56 ± 2.58	10.44 ± 2.90	1.163	0.804	0.08
Overall assessment index formative (21-105).	77.17 ± 12.28	75.70 ± 12.03	1.164	0.508	0.11
Age (years)	10.89 ± 0.75	10.75 ± 0.80	1.948	0.341	0.12
Size (cm)	150.04 ± 9.44	150.45 ± 8.48	1.434	0.803	0.08
Weight (Kg)	50.52 ± 13.16	47.10 ± 13.02	1.036	0.156	0.15
BMI (kg/m <sup>2</sup> )	21.89 ± 4.10	20.29 ± 4.21	1.122	0.037*	0.21
QD	7.47 ± 2.26	7.37 ± 2.78	2.629	0.828	0.08

Note. (\*) p < 0.05. M ± SD = mean ± standard deviation. A Global index of formative assessment calculated from the mean score of the six factors.

When analysing the differences in the responses to the dimensions of teachers' formative assessment practices considering weight status (see Table 2), no significant differences were found with any of the dimensions ( $p \geq 0.05$ ).

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**Table 2.**

*Differences in teachers' formative assessment practices considering weight status*

	Normal Weight M ± SD (n = 62)	Overweight M ± SD (n = 60)	F	p	d
Formative assessment associated with the (summative) rating (3-15).	9.13 ± 2.48	9.69 ± 2.85	1.650	0.253	0.12
Formative assessment proactive (3-15).	11.72 ± 2.49	11.52 ± 2.36	1.464	0.656	0.10
Formative assessment interactive (4-20).	15.28 ± 3.15	14.98 ± 3.26	1.002	0.613	0.10
Formative assessment metacognitive (4-20).	14.39 ± 3.83	14.66 ± 3.20	1.414	0.682	0.10
Formative assessment retroactive (4-20).	15.70 ± 2.91	14.79 ± 3.34	4.003	0.109	0.15
Formative assessment adjusted (3-20).	10.64 ± 2.52	10.34 ± 2.92	2.169	0.552	0.11
Overall assessment index formative (21-105).	76.87 ± 12.43	75.98 ± 11.84	1.154	0.688	0.10

Note. (\*) p < 0.05. M ± SD = mean ± standard deviation. A Overall formative assessment index calculated from the mean score of the six factors.

On the other hand, when analysing the differences in the teacher's formative assessment practices considering the quality of the diet classified as *improvable* vs. *optimal* (see Table 3), no significant differences were found with any of the scales ( $p \geq 0.05$ ).

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**Table 3.**

*Differences in teachers' formative assessment practices considering dietary quality*

	Improvable DQ M ± SD (n = 55)	Optimal DQ M ± SD (n = 67)	F	p	d
Formative assessment associated with the (summative) rating (3-15).	9.47 ± 2.62	9.35 ± 2.74	1.011	0.807	0.06
Formative assessment proactive (3-15).	11.23 ± 2.75	11.97 ± 2.05	4.898	0.092	0.18
Formative assessment interactive (4-20).	15.44 ± 3.23	14.86 ± 3.17	1.150	0.323	0.10
Formative assessment metacognitive (4-20).	14.79 ± 3.81	14.29 ± 3.24	3.026	0.439	0.10
Formative assessment retroactive (4-20).	15.51 ± 3.14	15.02 ± 3.17	1.216	0.392	0.10
Formative assessment adjusted (3-20).	10.74 ± 2.82	10.28 ± 2.63	1.691	0.354	0.10
Overall assessment index formative (21-105).	77.18 ± 13.15	75.77 ± 11.16	3.609	0.524	0.09

Note. (\*) p<0.05. M ± SD = mean ± standard deviation. CD = quality of diet. A Overall formative assessment index calculated from the mean score of the six factors.

Table 4 shows the joint relationship between weight status and diet quality with the teacher's formative assessment practices. ANOVA analysis showed no significant differences with any of the scales ( $p \geq 0.05$ ).

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**Table 4.**

*Differences in teachers' formative assessment practices considering weight status and dietary quality*

	Normal weight/ optimal DQ M ± SD (n = 36)	Normal weight / improvable DQ M ± DE (n = 25)	Overweight / optimal DQ M ± SD (n = 29)	Overweight / improvable DQ M ± SD (n = 32)	F	p	$\eta^2$
Formative assessment associated with the (summative) rating (3-15).	8.94 ± 2.48	9.40 ± 2.57	9.86 ± 3.00	9.53 ± 2.74	1.653	0.583	0.02
Formative assessment proactive (3-15).	11.89 ± 2.31	11.48 ± 2.77	12.07 ± 1.71	11.03 ± 2.76	1.141	0.336	0.03
Formative assessment interactive (4-20).	14.83 ± 3.13	15.92 ± 3.14	14.90 ± 3.28	15.06 ± 3.30	1.660	0.578	0.03
Formative assessment metacognitive (4-20).	13.86 ± 3.65	15.16 ± 4.02	14.83 ± 2.63	14.50 ± 3.68	1.766	0.215	0.04
Formative assessment retroactive (4-20).	15.08 ± 3.28	16.60 ± 2.04	14.93 ± 3.10	14.66 ± 3.59	2.083	0.106	0.04
Formative assessment adjusted (3-20).	10.39 ± 2.55	11.00 ± 2.48	10.14 ± 2.76	10.53 ± 3.09	1.467	0.706	0.02
Overall assessment indexformative (21-105).	75.00 ± 11.79	79.56 ± 13.07	76.72 ± 10.46	75.31 ± 13.11	1.818	0.487	0.04

Note. (\*) p<0.05. M ± SD = mean ± standard deviation. CD = quality of diet. A Overall formative assessment index calculated from the mean score of the six factors.

For the inferential analysis, a Pearson's *r* test was applied to analyse the possible correlation between the study variables (see Table 5). Neither the analysis of bivariate correlations (model I) nor the analysis of partial correlations (model II after adjustment for gender and age) showed a significant relationship between *Body Mass Index* and mean DQ score with the teacher's formative assessment practices ( $p \geq 0.05$ ) with the exception of proactive formative assessment and DQ ( $p < 0.05$ ).

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**Table 5.**

*Bivariate and partial correlations between teacher formative assessment practices, Body Mass Index and diet quality*

	BMI <i>r (p)</i>		DQ <i>r (p)</i>	
	Model I	Model II	Model I	Model II
Formative assessment associated with the (summative) rating (3-15).	0.157 (0.084)	0.069 (0.451)	0.025 (0.781)	0.051 (0.579)
Formative assessment proactive (3-15).	0.016 (0.857)	-0.019 (0.834)	0.253 (0.005)*	0.263 (0.004)*
Formative assessment interactive (4-20).	-0.042 (0.643)	-0.067 (0.471)	-0.003 (0.975)	-0.001 (0.989)
Formative assessment metacognitive (4-20).	0.043 (0.641)	0.050 (0.591)	-0.029 (0.749)	-0.040 (0.664)
Formative assessment retroactive (4-20).	-0.161 (0.076)	-0.133 (0.149)	0.006 (0.973)	0.004 (0.963)
Formative assessment adjusted (3-20).	-0.059 (0.521)	-0.081 (0.380)	0.125 (0.964)	0.005 (0.954)
Overall assessment index formative (21-105).	-0.016 (0.861)	-0.045 (0.625)	0.050 (0.588)	0.052 (0.573)

Note. Model I (raw). Model II (adjusted for sex and age). \*p-value < 0.05. BMI = body mass index; DQ = diet quality.

Finally, Table 6 presents the results of the multivariate regression analysis conducted in order to carry out a predictive analysis of the teacher's formative assessment practices on the combined variable *weight status/diet quality*. Being normal weight or overweight and having a higher optimal diet quality is associated with a higher likelihood of perceiving a proactive formative assessment ( $R^2 = 0.155$ ;  $p < 0.05$ ).

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**Table 6.**

*Weight status/diet quality according to teacher formative assessment practices*

	Normal weight/ optimal DQ	Normal weight / improvable DQ	Overweight / optimal DQ
	OR (IC 95%) <i>P</i>	OR (IC 95%) <i>P</i>	OR (IC 95%) <i>P</i>
Formative assessment associated with the (summative) rating (3-15).	0.89 (0.73-1.10) 0.300	0.93 (0.75-1.16) 0.558	1.02 (0.83-1.26) 0.831
Formative assessment proactive (3-15).	1.33 (1.02-1.72) 0.032*	1.04 (0.79-1.37) 0.774	1.37 (1.09-1.82) 0.029*
Formative assessment interactive (4-20).	0.88 (0.71-1.08) 0.231	1.00 (0.79-1.27) 0.969	1.85 (0.68-1.97) 0.180
Formative assessment metacognitive (4-20).	0.931 (0.78-1.10) 0.403	0.97 (0.80-.1.17)	1.97 (0.85-2.17) 0.772
Formative assessment retroactive (4-20).	1.13 (0.92-1.38) 0.222	1.31 (1.02-1.68)	1.09 (0.89-1.35) 0.382
Formative assessment adjusted (3-20).	0.93 (0.74-1.18) 0.578	0.93 (0.72-1.20) 0.607	0.85 (0.66-1.08) 0.199
Overall assessment indexformative (21-105).	0.99 (0.95-1.03) 0.855	1.03 (0.98-1.07) 0.191	0.96 (0.90-1.08) 0.607

Note: (\*)  $p < 0.05$ . Multinomial logistic regression considering the category Overweight/improvable DQ. A Overall formative assessment index calculated from the average score of the six factors.

## Discussion

The aim of this study was to analyse the relationship between the weight status and diet quality of fifth and sixth grade schoolchildren with their perception of the formative assessment applied by the PE teacher. The main findings of the study show a positive relationship between proactive formative assessment and diet quality adjusted and unadjusted for gender and age. Also, being normal weight or overweight and having an optimal diet quality were found to be associated with a higher likelihood of perceiving greater proactive formative teacher assessment.

Given that no studies have been found in the scientific literature in primary school students that analyse the association between these variables from the student's perception, this prevents direct comparisons from being made. In this sense, the studies that analyse the relationship between formative assessment practices and learning nutritional habits are very

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scarce in primary schoolchildren, hence the original approach of this study. In turn, these results take on greater importance given the age of the participants, since these are transcendental stages of life in which an appropriate formative assessment in the area of PE can have an impact on the internalisation of a healthy lifestyle pattern that improves their present and, therefore, future health status. Likewise, health education is a key element in the training of responsible citizens, which has always been present in the current legislation that has regulated Compulsory Education (Montero et al., 2020).

These results may be due to the fact that this type of formative assessment involves providing training activities aimed at consolidating and deepening the issues addressed or the competences of the students, and not at overcoming specific difficulties or mistakes made (Cerón et al., 2020). Likewise, this type of assessment is not only the core of knowledge, but also of being and know-how (Hortigüela-Alcalá et al., 2019). In this sense, throughout the LS, the need to apply the knowledge learned in the PE sessions on a daily basis was emphasised.

Therefore, it can be seen that the students who were achieving greater adherence to the DQ perceived greater feedback from the teacher throughout the sessions and the tasks they had to hand in both individually and as a group. In this way, students were more aware of the learning process, self-regulated their learning more, knew where to improve and how, applied the pedagogical treatment of the body and, in this way, found a practical application of this learning acquired at school to real-life contexts, thus achieving a didactic transposition between school and society (López-Pastor et al., 2020). In the light of these postulates, teachers must assess students with a life purpose and not with an academic objective, as reflected in the current education law in the section on competence training for learners (Organic Law for the Modification of the LOE). It is also clear that students must apply the contents of each teaching in an integrated way to solve complex problems, such as, at present, following an active and healthy lifestyle. Perhaps by advocating a formative assessment approach, being less restrictive, it will allow students to better accept themselves as they are in all areas, not feeling the pressure of being graded simply on their physical abilities. In this sense, it seems necessary to have a less standardised curricular model in PE, with more global references, where the motor dimension with an integrated nature should have a greater presence in PE curricula and which guides teachers on more formative assessment practices (Otero & Vázquez, 2019), as it is

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difficult for the status of teachers to improve while we continue to go with the flow of fashion or develop practices that are inconsistent with the most basic and fundamental educational principles (López-Pastor et al., 2016).

At the same time, it is essential to reach a consensus that echoes scientific advances on how to tackle children's sedentary lifestyles and promote healthy lifestyles in compulsory education and the school curriculum. There is currently a disparity in curricula, which represents a clear disadvantage for teachers in the event of a change of Autonomous Community, as they will have to develop programmes inspired by documents with substantial differences (Alonso et al., 2015). At the same time, it is worth highlighting the almost non-existence in most Autonomous Communities of guidelines for a more educational assessment in the area of PE, especially because they are based on very restrictive standards (Otero et al., 2020). In this manuscript, they point out differences in the load and timetable distribution of PE depending on the Autonomous Community, as well as the disparity in content and its sequencing. These aspects could conflict with the fundamental right of all pupils to receive a quality education that favours their all-round development. However, quality education should be the cornerstone of regulatory developments. In this sense, it is prescriptive to point out that at the legal level, the current Organic Law amending the LOE (LOMLOE) incorporates substantial changes with respect to the LOE, especially a new configuration of the curriculum with greater optionality, which may favour the development of Health competences by pupils.

Therefore, the university context must guarantee quality training for future teachers, especially in the area of health and assessment (López-Pastor et al., 2020). Possible solutions would be to give students an active role in the assessment and marking process. For example, a study of higher education students analysed students' perceptions of the assessment received throughout the school year, focusing on three key factors: I) individual and group responsibility; II) the regulation of work during the process and; III) the authenticity of the learning acquired linked to real life, it was observed how students who have participated in the distribution of marks perceive the learning process to be more guided and coherent, also assuming that it requires greater responsibility, both from oneself and for others. Similarly, it was shown that students who have worked more often in groups perceive the sharing of marks as a strategy that facilitates more authentic learning (Hortigüela-Alcalá et al., 2015). Likewise, the application of

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a formative assessment model in both primary school students (Herranz & López, 2017) and PE teachers shows a high degree of satisfaction and a high valuation of advantages, such as offering alternatives to all students and facilitating useful and active learning; while the greatest difficulties are related to the demands regarding student involvement (Rodrigo et al., 2016).

## Conclusions

On the basis of these results, the fact that a schoolchild has a higher or lower weight or quality of diet is not related to a higher or lower perception towards the assessment received; with the exception of proactive assessment.

These results may be of special interest to educational personnel, specifically to PE teachers, in order to contribute to improving the quality of the teaching-learning process and to orientate towards the comprehensive education of all pupils. In this way, students' academic achievement would be improved and it would be possible to orientate towards the comprehensive education of all students, using formative assessment as the basis of this educational process.

## Limitations of the study and proposals for improvement

It should be stressed that the findings of this study should be interpreted with caution given the methodological limitations derived from its cross-sectional nature (causal relationships cannot be established), the size of the sample, as well as the application of self-report questionnaires, which could generate certain biases in the assessment. At the same time, only students' perceptions have been taken into account, which is another limitation. However, although these results are not generalisable due to external validity, they can be used as indications to be taken into account in intervention and longitudinal programmes to corroborate whether an intervention programme aimed at the development of formative assessment by teachers can lead to improvements in the healthy habits of schoolchildren in these early stages of their lives.

In this sense, future studies with larger sample sizes should corroborate and shed more light on these findings. In turn, it would be interesting to apply a control group and an experimental group, as well as a pretest/posttest, aimed at finding out teachers' assessments at other educational levels, to analyse other predictors of health such as physical activity or

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physical condition, to study teachers' evaluation practices in depth from qualitative approaches or to develop teacher training itineraries in the field of formative assessment.

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