Differences in health-related quality of life by academic performance in children of the city of Cordoba-Argentina

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Abstract

Purpose The purpose of the study was to assess the differences in health-related quality of life (HRQoL) according to academic performance (AP) in children who attend public schools in the city of Cordoba, Argentina.

Methods Cross-sectional study carried out in a sample of 494 children aged 9–12 years (mean = 9.5; standard deviation [SD] = 0.65; IQR 1) who attended 4th grade of public schools in the city of Córdoba, Argentina in 2014. HRQoL was assessed by self-administration of the KIDSCREEN-52 child version in classroom. AP was established with the final grades in language and mathematics obtained from the school records. Marginal means and SD's of the HRQoL scores were compared between AP groups by calculating the effect size (ES), and linear mixed effect models were used to evaluate the (independent) association of AP with HRQoL.

Results Statistically significant differences were found in the psychosocial dimensions of the HRQoL between the AP groups. The main differences in HRQoL between children with very good–excellent grades and those with unsatisfactory AP were found in school environment (ES = 0.69), parent relation and home life (ES = 0.61), autonomy (ES = 0.61), self-perception (ES = 0.49), and social acceptance (ES = 0.48). Children with very good–excellent grades scored better in all of these dimensions.

Conclusions Children with very good–excellent grades in language and mathematics scored better in the psychosocial domains of HRQoL. AP is an important factor in the analysis of the social and psychological aspects of children's health. Further research is required to explore more deeply the direction and characteristics of this association.

Keywords Quality of life · Psychological dimensions of health · Academic performance · Children

Background

In childhood, one of the most important social functions is to attend school, participate actively in school life, and cope with its demands. Academic performance (AP) is an indicator of the level of learning achieved by a student and is used as the criterion to measure success or failure at school [1]. In some education systems, poor AP can result in students repeating courses or dropping out of school, which in turn can contribute to a process of social exclusion [2]. Likewise, the disruption caused to the child by having to repeat courses, coupled with weak learning skills, is a poor foundation for their later schooling and will play a key role in the construction of the child's self-concept, particularly in regard to learning ability [3].

Self-perceived standards of health, such as health-related quality of life (HRQoL), are multidimensional constructs that include assessing not only the physical and biological components of health, but also emotional, mental, social and behavioral components, well-being and the role perceived by the person [4]. Their multidimensional nature and the emphasis on daily functioning of HRQoL make these measures attractive for studying the link between school performance and health.

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Most studies of the association between school performance and health have examined the effects of specific health conditions on performance at school. Few have focused on healthy populations and evaluated the simultaneous contribution of a broad set of health factors to academic performance [5, 6]. Though the evidence suggests that being in good health is a condition for optimal learning [5–7], the relationship between these variables is complex. Some authors propose that the relationship may be two-way [6, 8], but there are even fewer studies on the repercussions of academic performance on perceived health.

Children's stressors have particular characteristics that change as the children develop [9]. Thus, a young child's stressors would be mostly associated with the family nucleus and attachment relationships, while a school-age child's stressors would be predominantly related to the school context, such as excessive school tasks, problems in interaction with teachers and peers, learning difficulties, low school grades, and repeating courses. These life events that take place at school may have different meanings depending on context, age, causes, and coping mechanisms, and may also affect child's development and health [10]. For example, Ojembarrena-Martinez et al. [11] showed that repeating a course is one of the factors that, together with other life events, contribute to a worse HRQoL. A study in Chile [12] found that schoolchildren who fail at school describe themselves as not being comfortable in the school environment and consider themselves to be worse than average.

Studying the relationship between education and health at the end of childhood is important because it is a developmental period of great vulnerability, marked by physical and psychosocial changes, frequently with a deterioration in school performance [13] and self-perceived health [14, 15]. Moreover, educational achievement and levels of health in childhood and adolescence have a profound effect on productivity and health in adulthood, making it a critical period for research [13, 16].

The purpose of this study was to assess the differences in HRQoL according to academic performance in children who attend public municipal schools in the city of Cordoba, Argentina, taking into account sex, school age, socioeconomic status, and maternal schooling of the participants. Based on the few studies found in other countries, we hypothesized a lower HRQoL index and a poorer perceived health on the psychosocial dimensions of HRQoL—in particular school environment and self-perception—in children with an unsatisfactory than in those with a satisfactory AP.

Materials and methods

Design, participants, and procedure

This was a cross-sectional study carried out in a sample of regular 4th grade students aged 9–12 years (mean = 9.5; SD = 0.65; IQR 1) who attended ten municipal public schools in the city of Córdoba, Argentina in 2014. The municipal educational system has a total of 37 schools, which in 2014 included 1594 children [17], distributed in the outskirts of the city. These are mostly urban areas, with a high population density, lacking local social, and care services.

For the sampling process, all the municipal primary schools ($n = 37$) were stratified by previous studies into two groups: those with more than 75% of parents with at least elementary education completed ($n = 20$) and those below this cut-off ($n = 17$). Ten schools were randomly selected from the first group and nine from the second. Of these 19 schools, the ten with the highest enrollment were chosen. The sample included all 4th grade students in the schools selected (average number of 4th graders per school = 53; range 32), reaching a potential pool of 533 students.

The objectives and characteristics of the study were explained to the school managers and child's caregivers (mother, father, or legal guardian) during a school meeting. Parents who did not attend the meeting received a note explaining the study. After providing all the necessary information about the study to the school community, informed consents were obtained. Trained research staff conducted the collective guided self-administration of the child questionnaires in classrooms. No exclusion criteria were initially applied, but the following possibilities for non-participation were recognized: children not willing to respond, children whose parents or legal guardian refused their consent to participate, and children who were absent at the time of administration of the questionnaires. Parents were also asked to complete a survey after the school meeting or at home.

During all stages of the research, the Guidelines for Research in Human Health of the Ministry of Health of Argentina were respected, and the working protocol was approved by the Ethics Committee for Health Research in Child and Adult Health (CIEIS del niño y del adulto—Polo Hospitalario) in April 2012.

Variables and instruments

HRQoL was assessed in October using the KID-SCREEN-52 child version questionnaire, which contains

52 items measuring ten dimensions of HRQoL: physical well-being (PH), psychological well-being (PW), moods and emotions (ME), self-perception (SP), autonomy (AU), parent relations and home life (PA), social support and peers (PE), school environment (SC), social acceptance (bullying) (BU), and financial resources (FI) [18]. The instrument has been culturally adapted for use in the population aged 8–18 years in Argentina [19] and the psychometric properties of the original version [20] were confirmed in that population [21]. Items are answered on Likert scales of frequency or intensity with scores of 1–5, from which an average score for each dimension is calculated. The averages are transformed into a continuous linear score using a Rasch model and then standardized to a mean of 50 with a SD of ten points, according to the methodology proposed by the European KIDSCREEN group [20]. As the KIDSCREEN-52 was designed to give only dimensions scores, not an overall score, we also calculated KIDSCREEN-10 scores, which was designed to be used as an index of HRQoL.

Academic performance was determined using each child's final grade for the school year in the core subjects of written language and math, obtained from academic records provided by the administrative offices of the participating schools. Final grades for primary school children are set by teachers at the end of the school year (November–December) using an ordinal scale with five grades (unsatisfactory, satisfactory, good, very good, and excellent). Assessment of the children's performance is through exams that contain questions and exercises related to material that should be covered in class. The content and procedures for presentation and evaluation are described in the core learning priorities (NAP) [22]. The grades obtained throughout the school year and child behavior in the classroom are aspects considered by the teachers in the final grade for each student, used as the measure of academic progress. We grouped children into three categories based on their final grades: (1) unsatisfactory (UNS), (2) satisfactory–good (S–G), and (3) very good–excellent (VG–E).

We also collected data on sociodemographic variables, such as sex, age, socioeconomic status (SES), and maternal schooling. Children's school age was considered as the difference in years between the child's age and the theoretical age for the child's current school year. SES comprises material and cultural living conditions, and was measured by means of the Family Affluence Scale (FAS) [23]. This scale has four questions on household material resources: number of cars and of computers owned by the family, whether the child has his/her own room, and family vacations in the past year. It is widely used in self-administered surveys in schools because it has a high response rate among children and adolescents [24], as well as an acceptable correlation with the family income level [25]. The FAS score was categorized,

in order to examine the effect of relative or approximate SES position, which more easily corresponds with classical SES groupings [25], as low (score: 0–3), middle (score: 4–5), and high (score: 6–9). Maternal schooling was asked in an adult survey and was defined by the highest school level completed by the mother according to the International Standard Classification of Education [26]. Two levels of categories were formed: mothers with incomplete secondary education or less and mothers with complete secondary education or more.

Statistical analysis

Descriptive statistics of sample characteristics included measures of central tendency and dispersion for quantitative variables and frequency distributions for categorical variables. Associations between variables were assessed using the Chi-square test for categorical variables and the student t-test or ANOVA for quantitative variables. Marginal means and SD's of HRQoL scores between AP groups were compared by calculating the effect size (ES). ES values between 0.20 and 0.50 represent small effects; between 0.51 and 0.80 moderate, and 0.81 or over large. To evaluate the association of AP with HRQoL, linear mixed effects models were developed with each of the dimensions of the HRQoL as dependent variables. This type of analysis is useful for correcting possible clustering effects in children nested within schools. The models were run using the AP in language and the AP in mathematics separately as independent variables, and all the models were adjusted by sociodemographic variables of theoretical interest. Data collected were analyzed using the statistical computing software R (emmeans and lme4 packages).

Results

Only those cases with data from the two main variables (HRQoL and AP) were included in the statistical analysis, and thus the final sample consisted of 494 students, 252 boys (51%) and 242 girls (49%), with a range between 9 and 12 years (mean = 9.5, SD = 0.65).

Sociodemographic characteristics of the study sample are shown in Table 1. There were equal proportion of boys and girls, 16% were over-aged, 14% were classified as low SES and mothers of 58% of the children report incomplete high school or less. No statistically significant differences were found in sociodemographic characteristics by sex.

The academic performance of the girls in the sample was better than that of the boys: girls had a higher proportion of very good–excellent grades (language: girls 38% vs. boys 23%, Mathematics: girls 34% vs. boys 29%) and a lower proportion of unsatisfactory grades (language: girls 8% vs. boys

Table 1 Sociodemographic characteristics of children attending 4th grade of municipal primary schools in the city of Cordoba, Argentina in 2014

	Girls	Boys	Total
Sex % (*n*)	49 (242)	51 (252)	100 (494)
Age X (SD)	9.48 (0.619)	9.54 (0.670)	9.51 (0.646)
School age % (*n*)			
Correct	83 (200)	87 (212)	83 (412)
Overage	17 (42)	13 (33)	16 (75)
Missing			1 (7)
Socioeconomic status% (*n*)			
Low	13 (31)	15 (37)	14 (68)
Middle	49 (118)	52 (131)	50 (249)
High	38 (90)	33 (83)	35 (173)
Missing			1 (4)
Maternal schooling % (*n*)			
High school incomplete or less	65 (142)	64 (147)	58 (289)
High school complete or more	35 (76)	36 (81)	32 (157)
Missing			10 (48)

13%, Mathematics: girls 7% vs. boys 12%). However, these differences were statistically significant only in language.

Academic performance in both subjects was negatively associated with school age. In language, for example, the proportion of children with very good–excellent grades was higher among those who had the theoretical age (33%) than those overage (13%). Also, the proportion of children with very good–excellent grades increased as their SES improved. The same trend is observed by maternal schooling (Table 2).

Regarding HRQoL, statistically significant differences were found by sex in the school environment dimension, with girls showing a higher score than boys (58.1 vs. 54.3; $P < .001$). Children with theoretical age scored higher in Psychological Well-being compared to those overage (54.8 vs. 51.1; $P < .05$). No statistically significant differences were found in HRQoL by socioeconomic status and maternal schooling.

Differences in HRQoL by AP groups and adjusted ES are presented in Fig. 1. Children with better grades in language and mathematics showed better scores in HRQoL. The main differences were found between the group of children with very good–excellent grades and those with unsatisfactory AP. In language, for example, differences were found in all dimensions of HRQoL between children with very good–excellent grades and children

Table 2 Academic performance in language and mathematics by sociodemographic characteristics of school children and their families

Sociodemographic variables	Total sample % (*n*)	Academic performance in language				Academic performance in Mathematics			
		Unsatisfactory % (*n*)	Satisfactory/good % (*n*)	Very good/excellent % (*n*)	*P* value *	Unsatisfactory % (*n*)	Satisfactory/good % (*n*)	Very good/excellent % (*n*)	*P* value *
Sex									
Female	49 (242)	8 (19)	55 (132)	38 (91)	0.001	7 (18)	58 (141)	34 (83)	
Male	51 (252)	13 (33)	64 (162)	23 (57)		12 (31)	59 (148)	29 (73)	0.131
Total	100 (494)	11 (52)	60 (294)	30 (148)		10 (49)	59 (289)	32 (156)	
School age									
Correct	85 (412)	8 (32)	59 (242)	33 (138)	0.000	7 (28)	57 (235)	36 (149)	
Overage	15 (75)	24 (18)	63 (47)	13 (10)		26 (19)	65 (49)	9 (7)	0.000
Total	100 (487)	10 (50)	59 (289)	31 (148)		10 (47)	58 (284)	32 (156)	
Socioeconomic status									
Low	14 (68)	19 (13)	51 (35)	29 (20)	0.036	19 (13)	56 (38)	25 (17)	
Middle	51 (249)	8 (20)	65 (161)	27 (68)		9 (22)	61 (151)	31 (76)	0.059
High	35 (173)	11 (19)	55 (95)	34 (59)		8 (14)	56 (97)	36 (62)	
Total	100 (490)	11 (52)	59 (291)	30 (147)		10 (49)	58 (286)	32 (155)	
Maternal schooling									
High school incomplete or less	65 (289)	11 (32)	60 (174)	29 (83)	0.059	10 (28)	62 (180)	28 (81)	
High school complete or more	35 (157)	6 (10)	55 (87)	38 (60)		6 (10)	52 (82)	41 (65)	0.013
Total	100 (446)	9 (42)	59 (261)	32 (143)		9 (38)	59 (262)	33 (146)	

*P values were computed using Chi-Square test
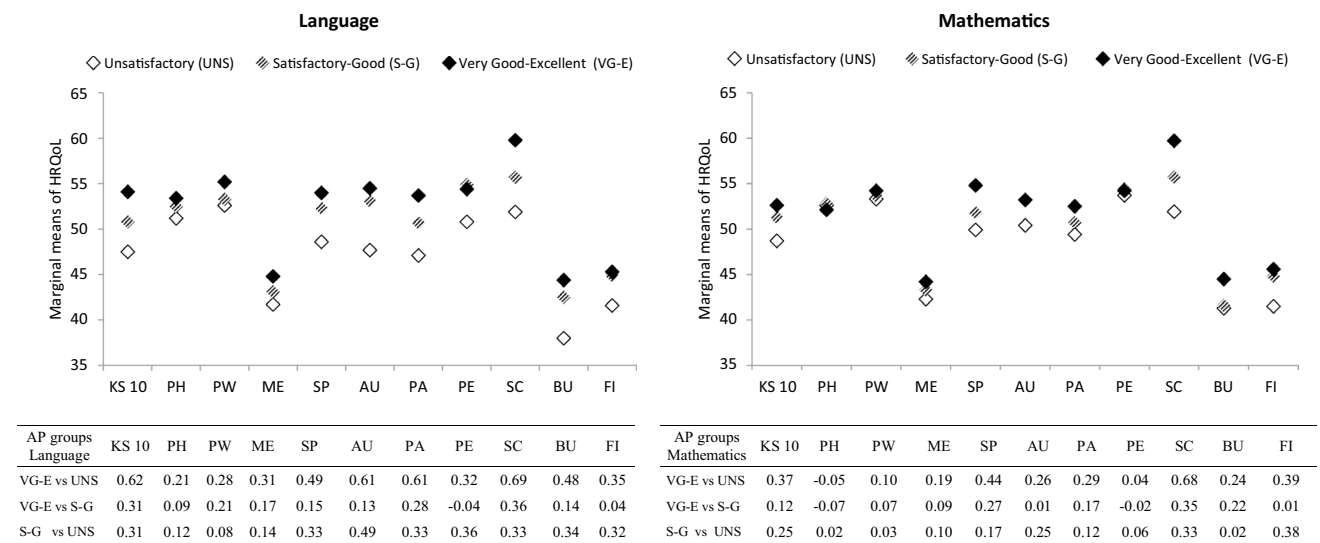
Fig. 1 Marginal means in health-related quality of life by academic performance and ES of the differences between AP groups in children who attend 4th grade of the municipal school in the city of Cordoba Argentina, in 2014. *KS 10*: Index Kidscreen-10, *PH* physical well-being, *PW* psychological well-being, *ME* moods and emotions, *SP* self-perception, *AU* autonomy, *PA* parent relation and home life, *PE* social support and peers, *SC* school environment, *BU* social acceptance (bullying), *FI* financial resources. Marginal means of the dimension of HRQoL and ES between AP groups were calculated adjusted by sex, school age, socioeconomic status, and maternal schooling. Positives ES indicates that the first AP group had a higher mean in HRQoL than the second AP group, and vice versa

with unsatisfactory AP. The ES was moderate in: KIDSCREEN-10 index (ES = 0.62), Autonomy (ES = 0.61), Relationship with parents (ES = 0.61), and school environment (ES = 0.69). In mathematics, children with VG–E grades scored significantly higher than children with UNS AP in: KIDSCREEN-10 index (ES = 0.37), self-perception (ES = 0.44), autonomy (ES = 0.26), Relationship with parents (ES = 0.29), school environment (ES = 0.68), social acceptance (ES = 0.24), and financial resources (ES = 0.39).

When comparing the S–G AP group with the UNS AP group in language, effect sizes were found on the overall index score of HRQoL and in eight dimensions of health (ranging from 0.32 for FI to 0.49 for AU). In Mathematics, effect sizes between these two groups were also found in the overall index score and in three dimensions of health, ranging from 0.25 for AU to 0.33 for SC, and 0.38 for FI. Differences were found between the S–G AP group and the VG–E AP group in both language and mathematics in fewer dimensions of health, and there was a low effect size (ranging from 0.21 to 0.36) (Fig. 1).

Multivariate analysis confirmed that HRQoL was positively associated with academic performance independently of sex, school age, SES, and maternal schooling. Linear mixed effects models are shown in Table 3. It can be seen that the overall index of HRQoL increases as the AP in language and mathematics improves. The score of children with VG–E AP in language was 5.4 higher in self-perception, 6.8 higher in autonomy, 6.6 higher in parent relation, 7.9 higher in school environment, and 6.3 higher in social acceptance,

than those with unsatisfactory AP. The same trend, with smaller betas, is observed comparing children with S–G grades in language versus children with UNS grades in this subject. Children with very good–excellent grades in mathematics had a 4.8 higher score in self-perception and school environment than those with unsatisfactory AP.

Discussion and conclusion

This study shows that the annual academic performance in the two core primary school subjects of language and mathematics is associated with the psychosocial dimensions of health. The main differences between the academic performance groups were found in the perceptions of school environment, relationship with parents, autonomy, self-perception, and social acceptance.

One of the strengths of the instrument used to measure HRQoL is that it captures the perceptions of children regarding their relationships with friends and peers, their family, and school life. As expected, perceptions of the school environment showed a strong, consistent association with AP, since large differences were found between children with high and low grades in their perception of their ability to learn, concentration and their general feelings about school. Students with better grades felt more comfortable with the school than those with worse grades. This reinforces the idea that a positive climate at school and a favorable environment can contribute to better

Quality of Life Research

Table 3 Health-related quality of life outcomes by academic performance in language and Mathematics

	KS 10 Beta (P value)*	PH Beta (P value)	PW Beta (P value)	ME Beta (P value)	SP Beta (P value)	AU Beta (P value)	PA Beta (P value)	PE Beta (P value)	SC Beta (P value)	BU Beta (P value)	FI Beta (P value)
AP language											
Unsatisfactory	Referent										
Satisfactory–good	3.32 (.055)	1.37 (.447)	0.68 (.679)	1.43 (.414)	**3.72 (.050)**	**5.45 (.002)**	**3.57 (.043)**	**4.12 (.035)**	**3.78 (.040)**	4.42 (.051)	3.21 (.069)
Very good–excellent	**6.57 (<.001)**	2.27 (.241)	2.66 (.127)	3.08 (.100)	**5.39 (.008)**	**6.78 (<.001)**	**6.58 (<.001)**	3.55 (.089)	**7.86 (<.001)**	**6.33 (.009)**	**3.76 (.047)**
AP mathematics											
Unsatisfactory	Referent										
Satisfactory–good	2.58 (.155)	0.22 (.910)	0.20 (.904)	1.05 (.551)	1.86 (.331)	2.72 (.147)	1.35 (.465)	0.99 (.626)	3.03 (.110)	0.29 (.900)	3.26 (.079)
Very good–excellent	**3.88 (.046)**	−0.51 (.811)	0.82 (.645)	1.90 (.314)	**4.86 (.018)**	2.85 (.154)	3.12 (.115)	0.81 (.711)	**4.78 (.019)**	3.18 (.201)	**4.05 (.042)**

Linear mixed effects models with random intercepts for children nested within schools

KS10 Index Kidscreen-10, *PH* physical well-being, *PW* psychological well-being, *ME* moods and emotions, *SP* self-perception, *AU* autonomy, *PA* parent relation and home life, *PE* social support and peers, *SC* school environment, *BU* social acceptance (bullying), *FI* financial resource

*Linear mixed effects models for each dimension of HRQoL were adjusted by sex, school age, socioeconomic status and maternal schooling. Statistically significant betas (*P* <.05) are shown in bold

learning [27], but also that the experiences of the children at school, such as their academic outcomes, may have an impact on the construction of their subjectivity, on the possibility of recognizing themselves as capable of learning, and on their desire to continue studying [3].

Perceptions of family environment seem to be worse among children with poorer AP, as we noted in an earlier study among adolescents in high schools [28]. As previous studies have suggested, the students' perceptions of their environment and family support exert a significant influence on school performance [29, 30], confirming the importance of family environment in the children's education and school performance, but there is little information on the impact of poor AP on the relationship between parents and children, recognizing that it is a source of concern because it affects the development of children and adolescents toward their life project.

Autonomy, an important developmental issue for creating an individual identity, refers to the child's freedom of choice, self-sufficiency and independence, in particular, the extent to which children feel able to shape their own life as well as being able to make decisions about their day-to-day activities. This study also looks at whether the child feels sufficiently provided with opportunities to participate in social activities, particularly in leisure activities and pastimes. It noted that children with poorer grades perceive less autonomy than those with better grades. The possibility to choose day-to-day activities, including recreational ones, autonomously and independently, comes from the cultural heritage and the economic possibilities enjoyed or suffered within the family. In childhood, it is common to see that leisure time, and the way to handle it, also depends on the child having satisfactory school outcomes. Given that some studies revealed that autonomy has a positive relationship with academic competence, levels of learning, interest in the task, and academic persistence [31, 32], it could be hypothesized that unsatisfactory school grades may reduce children's opportunities for effective and progressive growth in autonomy, while less autonomy may contribute to unsatisfactory academic results.

Children with better grades also present a higher score in self-perception. According to Fueyo-Gutierrez [33], students who accept themselves as they are, including their physical aspect, and maintain an idea of the acceptance that others have of them, are more likely to have better achievement and academic satisfaction. It seems that self-perception plays a fundamental role in academic performance, but academic achievement was also found to have positive effects on self-perception. Self-perception and AP thus appear to maintain functional interdependence: a high self-concept leads to high academic performance and vice versa [34]. The planning of intervention programs should therefore combine self-enhancement and skill development, otherwise the effectiveness of the intervention may be negligible.

Social acceptance explores the feeling of being rejected by peers in school as well as the feeling of anxiety towards peers. Most of the research has explored the effects of bullying on academic performance, but not vice versa, and has shown mixed results. Some studies postulate a significant negative relationship between bullying and academic performance [35, 36] while others argue that it is not possible to assert a lower academic performance because of bullying [37]. In this study, it has been noted that children with poorer grades feel more rejection by peers than those with better grades. Accordingly, it may be that unsatisfactory academic performance constitutes a source of discrimination and rejection among peers, but this hypothesis needs to be assessed because no previous studies were found that explore the effects of school performance on social acceptance.

Health and education are dynamically interrelated throughout childhood into adulthood. To understand how children's health affects their school outcomes and vice versa is a necessary first step toward reducing the achievement gap and health inequalities. Further research is required to explore more deeply the direction and characteristics of this association, and to identify the particular elements of children's health and the school environment which are susceptible to intervention and improvement.

Strengths and limitations

The possibility of attributing any causality to the relationship observed between perceived health and AP is limited in this study. Future investigations with a longitudinal design could attempt to assess the impact of poor performance or failure at school on children's psychosocial health and vice-versa. However, the use of school record scores to determine children's ability in language and mathematics may introduce information bias that leads to underestimating the association between the studied variables.

The study's strengths include the fact that that HRQoL was assessed using child self-reports in an instrument which has been shown to have good psychometric properties, and reveals multiple dimensions of health and from the child's own perspective.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflicts of interest with respect to the authorship and/or publication of this article.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was community-based, through meetings with school managers, teachers, and parents. The whole study was approved by the Ethics Committee for Health Research in Child and Adult Health (CIEIS del niño y del adulto—Polo Hospitalario) in April 2012.

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