MOTOR ACTIVITY, HANDWRITING AND PERCEPTION OF BODILY EXPERIENCE: AN EXPLORATORY INVESTIGATION

ATTIVITÀ MOTORIA, SCRITTURA MANUALE E PERCEZIONE DEL VISSUTO CORPOREO: UN'INDAGINE ESPLORATIVA

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ABSTRACT
Close contact with touch devices, on the one hand, promotes smart interaction with the virtual world, on the other, risks contracting the vitality of the body. This study represents a preliminary phase of an exploratory investigation, conducted with a sample of 60 children aged 10 and 11 years and investigates the relationship between lifestyle, manual writing ability and perception of self-esteem in relation to bodily experience, suggesting the need to protect and promote rich and significant motor experiences.

Lo stretto contatto con i device touch se da un lato, favorisce l'interazione smart col mondo virtuale, dall'altro, rischia di contrarre la vitalità del corpo. Il presente studio rappresenta una fase preliminare di una indagine esplorativa, condotta con un campione di 60 bambini di 10 e 11 anni e indaga la relazione tra stile di vita, capacità di scrittura manuale e percezione dell'autostima in relazione al vissuto corporeo, suggerendo la necessità di tutelare e promuovere esperienze motorie ricche e significative.

KEYWORDS
Motor activity; handwriting; bodily perception; Screen generation.
Attività motoria; scrittura manuale; percezione corporea; screen generation.

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Introduction

The pervasiveness of artificially intelligent machines and the increased use of technology (Orgiles et al., 2020) have immersed the human being, especially after the pandemic emergency, in a socio-cultural environment with liquefied and dematerialised boundaries where time seems to be dictated by the productive and efficient logics of the anthropocene (Crutzen, 2005) and marked by the tight rhythms of algorithmic procedures. In this cultural framework, educational policy is configured as a crucial issue of contemporary society and, in absorbing and acknowledging the renewed needs and new fragilities of the learner class, it takes on the difficult and delicate challenge of centring its didactic action on the wise dialogue and epistemological comparison between the interconnected paradigms of Neuropedagogy and Embodied Education (Gomez Paloma, 2013). Scientific research and educational discussion, in fact, move on the need to develop an artificial intelligence (AI) pedagogy capable of creatively, collaboratively, critically and consciously negotiating the indispensable benefits of the impact of technologies on everyday life and on learning-teaching processes and, at the same time, of dimensioning and placing the role of the human being in the boundless space and overlapping times of the virtual environment. The focus of didactic action (Rivoltella & Rossi,2012) is increasingly concentrated on the design and construction of learning places according to an approach that does not consider knowledge as granitic and monolithic, but orients learners and teachers within a sort of didactic contract (Rivoltella & Rossi,2012) within which actions are shared and the teacher designs his or her own actions facing, in a flexible and transformative manner, the physiological contradictions that emerge from the constant mediation towards the continuous restructuring of knowledge. If one agrees with the assumption that the person's training processes cannot be identified exclusively with what takes place in formal learning contexts, but with the complex framework of the community to which he or she belongs, knowing how to govern and resolve the phases and passages of contemporary technological transformation implies recourse not only to knowledge and skills that go to make up the teacher's teaching expertise, but also to sophisticated strategies of metacognition and reflection of the entire teaching process. The same normative literature on the national and international scene highlights the urgency of educating the educating community in the responsible use of AI to encourage a critical and responsibly ethical understanding of it. The European Commission, in

the Digital Education Action Plan 2021-2027, through the Ethical guidelines on the use of artificial intelligence and data in teaching and learning for educators, emphasises the value of designing an education capable of integrating digital competences into education systems in order to respond meaningfully both to the growing demand for individualised and personalised strategies and to take on and negotiate contemporary challenges in a prosperous and resilient manner. The advent of the use of touch devices on the global market coincides with the updating of the vocabulary of generational definitions (Notte & Renzi, 2024) which frames people born between 2010 and 2024 with the expression Generation Alpha or Screen generation, that is, the generation characterized by an innate familiarity with digital technologies in smart technologies. If on the one hand, the digitalization of services and the online world of cloud platforms have inevitably multiplied the learning opportunities in the direction of overcoming deterministic development and learning models in favor of multifactorial and integrated models, on the other hand, if not appropriately negotiated, they risk leading the new generations to a severe contraction of the vitality of the body (Milani, 2011), which seems to confine and freeze in a sort of offline mode within the boundaries and perimeters of the two-dimensionality of the web. Scientific literature describes the spread of new phenomena such as binge watching, or the addiction to the use of mobile devices, and Information Fatigue Syndrome, or the fatigue induced by overexposure to information with important repercussions on analytical skills, attention disorders and the inability to take responsibility (Biamonte, 2017). Furthermore, international literature suggests that excessive exposure to media is associated with obesity in early childhood (Wethington, Pan & Sherry, 2013), sleep disorders (Bruni et al., 2015; Hale & Guan, 2015; Brown & Council of Communication and Media, 2011; Cespedes et al., 2014), cognitive, linguistic, emotional and social delays (Reid Chassiakos et al., 2016) and in adolescents with the onset of psychiatric disorders (Ko et al., 2012) and the tendency to develop alcohol addiction and substance abuse (Reid Chassiakos et al., 2016). In light of the considerations that have emerged, this contribution aims to observe the relationship between the adoption of a sedentary lifestyle, also induced by the pervasiveness of technological tools, the decreased perception of self-esteem in reference to bodily experience (TMA, Bracken, 2003) and the progressive loss of skills related to handwriting in school age, especially in cursive form, as well as an increasingly high percentage of writing difficulties and/or dysgraphic disorders (Di Brina et al., 2022) recorded at the end of the primary education cycle, through a study that represents a

preliminary phase of an exploratory investigation conducted with a sample of 60 children aged between 10 and 11 years. The real educational challenge of the contemporary world seems to emerge with the focus on an educational approach that is able to assume, in the perspective of a bio-psycho-social development of the subject (Nicolodi, 2015), a planning of educational interventions attentive to valorising a plurality of experiences of action through which identity, starting from the bodily one, can be structured through the ability to imagine and creatively construct one's own self for a re-appropriation of the humanly perceptive dimension of the self, of otherness and of one's own abilities.

1. Methodology

1.1 Research Objective

The aim of the present study, which constitutes a preliminary phase of an exploratory investigation, is to analyse the relationship between lifestyle (sedentary versus active), the perception of self-esteem in reference to body experience (measured by means of the Multidimensional Self-Esteem Test, TMA, Bracken, 2003) and handwriting ability (assessed by means of the BHK scale, Concise evaluation scale for children's handwriting, Di Brina & Rossini, 2021). The hypothesis is that the acquisition of a sedentary lifestyle can affect the child's overall development both in terms of the perception of self-esteem, with reference to body experience, and with respect to handwriting skills.

1.2 Sample

The present research involved a convenience sample of 60 children attending the first classes of secondary school, at the Galvani and Opromolla Institutes in the province of Salerno (solar year, 2022/2023). The participants, aged between 10 and 11 years (completed by the month of December), were selected by means of non-probabilistic sampling. Of the data collected, those of 58 subjects were valid (M=32; F= 28). The distribution and frequency of the sample were analysed considering two main variables: gender, which shows a homogeneous distribution (Tab. 1), and age, which shows a homogeneous distribution (Tab. 2). For the evaluation of motor activities, the QUAM -Questionnaire of Motor Activities- was specially structured on 8 items investigating the practice of sports activities in different contexts: extracurricular, structured, unstructured, recreational and specific sports. From the

analysis of two specific items, the sample was divided into the categories of 'sedentary' and 'active'. The results indicate that the sample is unevenly distributed with respect to this variable, with 42 subjects classified as 'active' (72.4%) and 16 as 'sedentary' (27.6%) (Tab. 3). On the other hand, with respect to the administration of the TMA on body experience, the sample is distributed predominantly for the category of 'Extremely negative self-esteem' (27.6%) (Tab.6).

		Frequency	%
Valid	F	26	44,8
	M	32	55,2
	Total	58	100,0

Table 1. Gender frequency on total sample

		Frequency	%
Valid	10	36	62,1
	11	22	37,9
	Total	58	100,0

Table 2. Age frequency on total sample

		Frequency	%
Valid	sedentary	16	27,6
	active	42	72,4
	Total	58	100,0

Table 3. Frequency comparison between groups active and sedentary

1.3 Methodological tools and procedures

The study, of an exploratory nature and conducted in the field, adopted a mixed methodological approach, combining qualitative and quantitative techniques (Trinchero & Robasto, 2019; Lucisano & Salerni, 2002). To investigate the relationship between lifestyle, body experience and handwriting, two standardized and validated tools were used: the BHK scale for the evaluation of the graphic gesture (Di Brina & Rossini, 2021) and the Multidimensional Self-Esteem Test (TMA; Bracken, 2003). The BHK scale, "Synthetic scale for the evaluation of writing in developmental age" (Di Brina & Rossini, 2021), is the Italian adaptation of the Dutch original (Hamstra-Bletz, De Bie & Den Brinker, 1987). This tool allows to systematically observe and analyze the quality and speed of writing in

developmental age. The evaluation of quality is based on parameters relating to spatial organization, motor skills and the shape of graphemes. The test consists of transcribing a short text in cursive, with increasing complexity, to be completed in a maximum time of 5 minutes. The transcription takes place on a blank sheet of paper, without pre-set lines, and the child must coordinate the graphic gesture using only his/her own motor skills, fluency and precision of writing. For the evaluation, at least the first five transcribed lines are considered, on which the writing quality analysis will be performed. Writing speed is measured by counting the number of characters produced within the established time. To explore the bodily experience in relation to self-esteem, the Multidimensional Self-Esteem Test (TMA; Bracken, 2003) was administered, a standardized instrument for subjects aged between 9 and 19 years. The TMA assesses global self-esteem through six subscales: interpersonal relationships, environmental control skills, emotionality, academic success, family life and bodily experience. Considering that each subtest of the TMA "is sufficiently reliable and valid to allow its individual use" (Bracken, 2003, p. 30), in this study it was decided to administer only the subtest relating to the "bodily experience scale".

2. Results

Data collection took place in the first half of the school year, through collective administration in the presence of teachers. Students were informed that participation was voluntary and that the compilation was anonymous. The survey initially involved the administration of the BHK scale, followed by the questionnaire relating to the "body experience scale" of the TMA. At the end of the collection phase, the data were subjected to scoring, interpretation and analysis. First, they were coded and entered into MS Excel (version 2019) and, subsequently, analyzed using the statistical software IBM SPSS Statistics (version 28).

3. Discussion

In relation to the starting hypothesis according to which the sample of 42 active subjects (Table 3) would present a higher percentage of positive values both for self-esteem and for the domain of writing quality and speed, a comparison was made using contingency tables, which allow to relate the dependent factors of the TMA test and the BHK, in its two domains, with the independent factor represented by the division of the groups into sedentary and active. Furthermore, bivariate

analyses were conducted using the ANOVA technique to compare the frequencies and percentages of the scores for each scale in relation to the different variables considered. As regards the BHK test, in the domain of writing quality, the following data emerge in the total sample (Table 7): “Borderline” (3.4%), “Disgraphic” (1.7%), “Expert” (94.8%). In the domain of writing speed, the following percentages are found: “Slow” (19%), “On average” (55.2%), “Quick” (25.9%). It is therefore evident that the sample is mainly distributed in the “Expert” category for writing quality, while for writing speed the greatest concentration is found in the “On average” category. In relation to the gender factor and writing speed, it emerges that male subjects possess a better graphemic production than females. Specifically, from the contingency table (Table 4) it is possible to observe the distribution in the following categories: “Slow” (F=7; M=4), “On average” (F=14; M=18), “Quick” (F=5; M=10). In parallel, regarding the division of the sample into sedentary and active groups, in relation to gender, a higher frequency of sedentary subjects is found among females (F=10; M=6), while a greater presence of active subjects is recorded among males (F=16; M=26) (Table 5). From the comparison of the data, a relationship between writing speed and active lifestyle would seem to emerge.

		F	M	Total
BHK_Writing speed	Slow	7	4	11
	In average	14	18	32
	Quick	5	10	15
Total		26	32	58

Table 4. Contingency table BHK writing speed and gender factor

		F	M	Total
Active_sedentary	sedentary	10	6	16
	active	16	26	42
Total		26	32	58

Table 5. Active VS Sedentary and gender factor.

About the dimension of the “Body Experience Scale” of the TMA test, based on the scores obtained from the total sample, the test provides a classification of self-esteem distributed across four levels with their respective percentages: “Extremely negative self-esteem” (27.6%), “Very negative self-esteem” (36.2%), “Slightly negative self-esteem” (24.1%) and “In average self-esteem” (12.1%) (Table 6). The values relating to the levels of self-esteem in the total sample are mainly distributed between negative and average levels, while no values are detectable for the positive levels of self-esteem; consequently, the three levels of “Slightly positive self-esteem”, “Positive self-esteem” and “Extremely positive self-esteem” are

absent. The detection of this first data suggests the need to rethink and review educational actions in the school context, to raise teachers' awareness of the design of interventions aimed at improving students' perception of self-esteem. With regard to the perception of self-esteem in relation to gender, the analysis of the data reported in Table 6 shows intragroup differences: “Extremely negative self-esteem” (F=30.8%; M=25%), “Negative self-esteem” (F=42.3%; M=31.3%), “Slightly negative self-esteem” (F=23.1%; M=25%) and “In average self-esteem” (F=3.8%; M=18.8%). In general, the comparison of these data seems to suggest, once again, that male subjects tend to present more favorable values. It can be hypothesized that these results derive from a possible interrelation between an active lifestyle, greater fluency in handwriting and a more positive perception of self-esteem These considerations, however, are affected by the partiality of the survey both in relation to the non-homogeneous composition of the total sample, 27.6% sedentary and 72.4% active (Table 3), and in relation to the lack of a specific survey on the intra-group gender factor.

			F	M	Total
TMA_ bodily experience scale	Extremely negative self-esteem	Counting	8	8	16
		% TMA	50,0%	50,0 %	100 ,0%
		% gender group	30,8%	25,0 %	27, 6%
	Very negative self-esteem	Counting	11	10	21
		% TMA	52,4%	47,6 %	100 ,0%
		% gender group	42,3%	31,3 %	36, 2%
	Slightly negative self-esteem	Counting	6	8	14
		% TMA	42,9%	57,1 %	100 ,0%
		% gender group	23,1%	25,0 %	24, 1%
	In average self-esteem	Counting	1	6	7
		% TMA	14,3%	85,7 %	100 ,0%
		% gender group	3,8%	18,8 %	12, 1%
Total		Counting	26	32	58
		% TMA	44,8%	55,2 %	100 ,0%
		% gender group	100,0%	100,0 %	100 ,0%

Table 6. TMA bodily experience scale and gender factor.

As regards the BHK score, in relation to the quality of writing, the sample is mostly distributed in the “Expert” category (55 subjects), while only one case falls into the “Dysgraphic” category and two cases into the “Borderline” category (Table 7). The data that emerged, considering the limitations and partiality of the survey, especially in reference to the non-homogeneity of the sample, would suggest that the greater presence of subjects in the “Expert” category in relation to the quality of writing, could be associated with the active lifestyle. In support of this hypothesis, it could be further considered that the only case belonging to the “Dysgraphic” category emerged precisely from the sedentary group (Table 7). Scientific literature and national and international legislation, from this point of view, support this hypothesis, agreeing in reporting how an active lifestyle can contribute to promoting, for the individual, the achievement of bio-psycho-social well-being (WHO, 2016; 2018) and how a sedentary lifestyle, linked to the excessive and non-negotiated use of technological devices, can contribute to the progressive loss of fluidity of the graphic line (Natta, 2016).

			Sedentary	Active	Total
BHK_quality	Borderline	Counting	0	2	2
		% BHK quality	,0%	100,0%	100,0%
		% groups	,0%	4,8%	3,4%
	Dysgraphic	Counting	1	0	1
		% BHK_quality	100,0%	,0%	100,0%
		% groups	6,3%	,0%	1,7%
	Expert	Counting	15	40	55
		% BHK quality	27,3%	72,7%	100,0%
		% groups	93,8%	95,2%	94,8%
Total		Counting	16	42	58
		% BHK_quality	27,6%	72,4%	100,0%
		% groups	100,0%	100,0%	100,0%

Table 7. Contingency table BHK Quality.

This hypothesis seems to be further supported by the results of interest that emerged in reference to the writing speed according to the BHK scale. It is possible to observe, in fact, significant differences in favor of the active group compared to the sedentary ones (Table 8). In the "slow" category, the sedentary ones represent 25% of the subjects, while the active ones represent 16.7%. In the "normal" category, however, the percentages are similar between the two groups, respectively 56.3% and 54.8%. It is also important to point out that, in the "Quick" category of graphemic production, the sedentary ones constitute 18.8%, while the

active ones reach 28.6% (Table 8). Considering these results, the active group proves to be faster in terms of writing speed, confirming, once again, what has been described in the literature regarding the relationship between motor behaviors, writing skills and fine motor skills (Lovecchio et al. 2018).

			Sedentary	Active	Total
BHK Writing speed	Slow	Counting	4	7	11
		% Writing speed	36,4%	63,6%	100,0%
		% groups	25,0%	16,7%	19,0%
	In average	Counting	9	23	32
		% Writing speed	28,1%	71,9%	100,0%
		% groups	56,3%	54,8%	55,2%
	Quick	Counting	3	12	15
		% Writing speed	20,0%	80,0%	100,0%
		% groups	18,8%	28,6%	25,9%
Total		Counting	16	42	58
		% Writing speed	27,6%	72,4%	100,0%
		% groups	100,0%	100,0%	100,0%

Table 8. Contingency table BHK Writing Speed.

In the comparison between the levels of self-esteem detected through the body experience scale, administered with the TMA test, between the groups of active and sedentary subjects, the following results emerge: for the level of "extremely negative self-esteem", a percentage of 25% is observed in sedentary subjects and 28.6% in active subjects; for the level of "very negative self-esteem", the percentages are respectively 37.5% in sedentary subjects and 35.7% in active subjects; for the level of "slightly negative self-esteem", the sedentary group represents 31.3%, while the active group represents 21.4%. A particularly interesting result concerns the level of "average self-esteem", which is associated with a percentage of 6.3% in sedentary subjects and 14.3% in active subjects (Table 9). Analyzing the TMA data and comparing the internal distributions of the two groups, a slight, almost significant, difference is observed, which suggests that active subjects tend to have a less negative self-esteem than sedentary subjects, in accordance with what is reported in the literature (Jackson and Marsh, 1986; Smoll et al., 1993; Marcolongo & Mariani, 2018).

			Sedentary	Active	Total
TMA_ bodily experienc e scale	Extremely negative self-esteem	Counting	4	12	16
		% TMA	25,0%	75,0%	100,0%
		% groups	25,0%	28,6%	27,6%
	Very negative self-esteem	Counting	6	15	21
		% TMA	28,6%	71,4%	100,0%
		% groups	37,5%	35,7%	36,2%
	Slightly negative self-esteem	Counting	5	9	14
		% TMA	35,7%	64,3%	100,0%
		% groups	31,3%	21,4%	24,1%
	In average self-esteem	Counting	1	6	7
		% TMA	14,3%	85,7%	100,0%
		% groups	6,3%	14,3%	12,1%
Total		Counting	16	42	58
		% TMA	27,6%	72,4%	100,0%
		% groups	100,0%	100,0%	100,0%

Table 9. Contingency table TMA bodily experience scale.

Conclusions

The data emerging from this preliminary phase of the investigation seem to suggest the existence of a possible relationship between lifestyle, body experience and handwriting ability, although the size of the sample does not confer absolute significance to the results. However, the importance of promoting rich and diversified motor experiences in developmental age seems to be confirmed, "[...] since people are their bodies [...]" (Bracken, 2003, p.20). In particular, it emerges, despite the heterogeneity of the sample, how the group of children with an active lifestyle reported, compared to the group of children with a sedentary lifestyle, slightly higher and almost significant results both in the evaluation of writing (BHK; Di Brina & Rossini, 2021) and in the perception of self-esteem in relation to body experience. . These results would suggest that the corporeality underlying an active lifestyle can play an important role in the overall development of the person, presumably influencing both self-esteem and graphomotor skills. It is therefore not just a matter of "doing exercise", but of having significant experience through the body, re-signifying corporeality as a space for interaction, expression and learning, especially in light of the current social context, increasingly dominated by digitalization and the pervasiveness of technologies. The interaction and dialectical relationship between corporeality, self-esteem and graphic gesture can take on decisive connotations in the contemporary educational context, highlighting the

need to support educational projects that, in taking into account the growing distancing from concrete and bodily experiences in favor of interactions increasingly mediated by technological devices, are able to restore centrality to sensorimotor experiences, promoting an integrated teaching method that favors the development of the child in its entirety (Gallagher, 2005). However, it should be noted that this study has some limitations, starting from the relatively small sample size and the nature of the survey, which, although transversal, does not allow to establish significant relationships between the variables. Furthermore, the classification between "active" and "sedentary" is based on qualitative and observational data, which could benefit, in future studies, from the integration of objective monitoring tools of physical activity. The prospects for future research lie in the intention to extend the investigation to larger and more diversified samples, adopting a longitudinal design, to deepen the understanding of the interactions between body, learning and the construction of self-esteem. The hypothesis is to continue with further research that can investigate the ways in which the body experience influences learning, not only in writing, but also in other cognitive domains, with the possibility of carrying out the administration of experimental educational interventions that draw on the constructs of body pedagogy (Gamelli, 2006) and motor-expressive activities.

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