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Research Article

Empathy, Motor and Psychosocial Development in A Sample of Greek Elementary School Students with and Without Deafness/ Hard of Hearing: Application of the Theory of Mind

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Abstract

Children with deafness/ hard of hearing (D/HH) have a number of limitations in key aspects of their psychosocial development, resulting in delayed receive of social and emotional stimuli [1]. Empathy is considered important for the development of social behavior and the relationships that children develop among them. Deficits in empathy can play a critical role in the development of openness and may lead to the establishment of additional behavioral problems. Therefore, D/HH children tend to develop empathic abilities lower than their hearing peers, with adverse effect on the initiation and maintenance of social relationships, and their psychosocial development in general. Further, children with D/HH experience restrictions in motor development, especially in gross motor and balance skills [2]. Interventions designed to address these restrictions may start as early as possible in order to have more scope for development [3].

The present study was designed to evaluate holistically the motor and psychosocial development, empathy and Theory of Mind (ToM) in students with and without D/HH. The total sample consisted from 27 students with D/HH and 31 students with no disabilities who served as controls. Both groups were reqruited from schools in the wider area of Attica/Athens. More specifically, the following assessments were conducted: a) motor development, empathy, ToM and teacher reports on strengths and difficulties the students possess. The goal was to determine the relationships among the above assessments and the differences between students with and without D/HH. The statistical analyses revealed that the students with D/HH had lower scores in motor development, empathy and ToM. In contrast, there were no differences between the two groups regarding the strength and difficulties they experienced. Finally, the assessments were all related significantly with each other, while empathy and ToM scores predicted the motor development of the students with and without D/HH. The findings are discussed with respect to the Theory of Mind.

Keywords: Deaf-Hard of Hearing (D/HH); Motor and Psychosocial Development; Empathy; Theory of Mind (Tom)

Introduction

Children with deafness/ hard of hearing (D/HH) experience a number of limitations in key areas of psychosocial development [4,5], mainly due to communication barriers causing difficulties upon the establishment of social relationships [6]. Students with D/HH often exhibit emotional deficits hampering their social relationships with peers and deviates from the school standards compared to their same-age counterparts without D/HH [7]. The above argument is supported from the fact that D/HH children receive fewer social and emotional information [1] since the first years of their lives [8].

Empathy is defined as the perception and ability to understand the emotional states and respond to the feelings of others [9]. Jolliffe and Farrington [10] and Zahn-Waxler, Radke-Yarrow, Wagner and Chapman [11] considered empathy as the major driving force behind many social behaviors that enhance coherence and cooperation. Deficits in empathy can play a critical role in the development of openness and the emergence of behavioral problems [12,13,14]. With respect to children with D/HH, the experienced difficulties in communication may lead to reduced opportunities for the parallel learning of highly abstract concepts, such as emotions [15,16] suggested that deaf preadolescents exhibit lower levels of emotional identification and labeling of emotions than their peers without hearing problems. Their distorted ability to recognize emotions is essential to adequately develop empathic abilities [16]. Rieffe [17] supported the above argument and claimed that the D/HH exhibit less efficient regulation of emotions compared to their counterparts without disabilities. Moreover, prelingually deaf preadolescents are more vulnerable than postlingually deaf [18]. Overall, D/HH children tend to develop lower empathic abilities compared to same age peers, with adverse effect on the initiation and maintenance of social relations, and their psychosocial development in general [16].

Children with D/HH may experience delays in gross motor skills, fitness, balance and motor development in general [2]. Gallahue and Ozmun [19] stated that the motor development in general interacts in complex ways with the affective and cognitive development and are all influenced from several environmental, task-specific and biological factors. Further, the systems affecting motor development are interactive, and 'tend to promote self-initiating and self-organizing movement behaviors' (Sherrill, 2004, p. 491). Sherrill [2] suggested that the teaching methods and materials used and remain in the literature, for children with and without disabilities, may support them to acquire, through playing, the necessary skills required in all developmental areas across their life span (motor, psychosocial, communication, cognitive). The holistic and integrated approaches may lead, eventually, through 'play, creativity and concurrent attention to language development' [2].

The Theory of Mind (ToM) formed the theoretical basis for the design and implementation of the present research study [20,21]. The ToM identifies, in general, the individual awareness of how mental states such as memories, beliefs, desires, and intentions govern the behavior of self and others [21]. According to Baron–Cohen [22] it describes the necessary states and the essential abilities describing humans, while Peterson., *et al*. [21] claimed that it is the cornerstone of social intelligence and satisfying social interaction, developing rapidly during the preschool period.

According to Premack and Woodruff [20], the ToM describes the process of understanding and predicting the behavior of our fellow individuals. Wellman [23] and Premack and Woodruff (1978) [20] claimed that the ability to make inferences about the psychological states of others and to predict or explain their behaviour with reference to their mental states, feelings, beliefs and desires, is an essential element to successful communication. Finally, Povinelli and Giambrone [24] stated that the ability to attribute mental states to others is known as "mind-reading" or having a ToM.

Research evidence suggests that deaf children, in particular late-signing or oral deaf children, have a delay or a deficit in ToM compared to hearing preschoolers [25], due to difficulties in language acquisition and opportunity to talk. According to Peterson, Wellman and Slaughter [23], many deaf children, from normal-hearing families, are seriously delayed in understanding the mental states described above in the ToM [26]. Children with D/HH however, who use sign language, from deaf parents, manage to develop the mental states of ToM to a corresponding degree of their normal-hearing peers [21,27]. The conquest seems possible through the interaction and exchange of views with members of their family through a common language (sign language or oral), through which they understand the beliefs, intentions, desires and emotions of themselves and the people surrounding them [21,27].

Overall, it appears that the students with D/HH experience delays in certain attributes of their psycosocial and motor development, such as their empathic abilities, the metal states described in the ToM, their gross motor skills etc. Considering the holistic approach in human development [2,19], these attributes appear as inter-related, but our literature review did not reveal any studies examining their respective association. Based on the above, the present study was designed to examine the association among the psychosocial and motor attributes of elementary school children with D/HH. In an attempt to expand previous results and establish the validity of the present findings, the differences between children with and without D/HH, in empathy, ToM and motor develop-

ment were examined too. We anticipated significant intercorrelations among empathy, ToM and motor development. Further, we anticipated that children with D/HH would have lower scores in empathy, ToM, psychosocial and motor development, compared to their counterparts without D/HH. The independent variables were: disability (students with and without D/HH), type of loss (deafness, hard of hearing), onset of D/HH (prelingual and postlingual), communication (sign language, oral, combined), parent's loss (with and without D/HH) and hearing aid (cochlear implant, hearing aid). The dependent variables were motor development, psychosocial development, empathy and Theory of Mind (ToM).

Methods

Participants

A convenience sampling design was used for the purposes of the study. The sample consisted from 58 elementary school students, with (N=27) and without D/HH (N=31). The participants were boys (N=38, 65.5%) and girls (N=20, 34.5%), aging 8-12 years old (mean=11.02 years + 0.87), and their demographic characteristics are presented in table 1. The students were able to follow simple instructions and fulfill the study requirements, were living in the wider area of Attica/Athens, attended two specialized schools for the deaf or two 'general' schools in the same area, and their records revealed no other comorbid conditions (e.g. ADHD) besides D/HH.

Measures

The following measures were used for the purposes of the study:

- The short-form of the Bruininks Oseretsky Test of Motor Proficiency-2 [28] was used to assess motor development. The BOT-2 is consisted from 14 gross and fine motor tasks. These tasks require approximately 15 - 20 minutes to complete and are divided into the following eight (8) areas: fine motor precision, fine motor integration, manual dexterity, bilateral coordination, balance, running speed and agility, upper-limb coordination, and strength [28]. The validity of the BOT-2 (content, concurrent, construct) has been tested and verified by Bruininks and Bruininks [28].
- The Theory of Mind (ToM) was examined with the Greek version [29] of the "Reading the Mind in the Eyes" (RMET) for children test [30]. The RMET was developed to assess

Variable	M	SD	N
Age (days total)	11.02	0.87	58
Gender			
Boys			38
Girls			20
With D/HH			27
Without D/HH			31
D/HH			14
			13
Communication			
Signed			9
Combined(signed+ oral)			18
Hearing device			
Cochlear implant (CI)			8
Hearing aid (HA)			6
CI+HA			3
None			10
Acoustic status of parents			
deaf parents			2
hearing parents			54
hard of hearing parents			1
Only one hard of hearing parent			1
Prelingual			23
Postlingual			4
Athletic experience			52
Without athletic experience			6

Table 1: Demographic characteristics.

children's ability to recognize mental states of people through information provided by the area around the eyes. It consists from 28 pictures of the area around the eyes (of different individuals). Every picture is accompanied with four possible responses (words or phrases) of which only one is correct. The respondent is asked, in each picture, to select the response (word or phrase) that he/ she believes it matches with what exactly that person feels or thinks. The researchers offer encouragment without revealing to the respondent if they are right or wrong. According to Baron-Cohen., *et al.* [30], the test involves both simple and complex mental states without expressing beliefs for the person who manifests them in

the pictures. According to Baron-Cohen., *et al.* [30], the RMET corresponds both in the emotional and the cognitive mental states of the respondents. According to Vogindroukas., *et al.* [29], the RMET scale has satisfactory reliability and internal consistency (Cronbach a 0.687).

- The Greek version [31] of the Index of Empathy for Children and Adolescents [32] was used. It is a self-report scale which consists of 22 statements, which seek to determine whether the children and adolescents are able to express emotional empathy in specific emotional states of others. The responses in each statement are either "yes" (if the content of the proposal fits with what the respondent thinks) or "no" (if the content of the proposal does not match what the respondent thinks). The statements, depending on the answers, express the extend of displayed empthy (high vs low empathy). In particular, the questions answered by a "yes" (questions no 1, 4, 5, 6, 7, 8, 11, 12, 13, 14 and 19), contribute most to the voltage of the individual to high empathy, while those negatively expressed (question no 2, 3, 9, 10, 15, 16, 17, 18, 20, 21 and, 22) contribute to low empathy. The responses in each statement are ranging from zero (0: NO) to one (1: YES). The negative questions are reversed and the final estimation of empathy is based on the aggregation of scores. The highest possible score is 22 and the lowest is 0. Higher scores indicate higher levels of empathy while lower scores indicate lower levels. The internal consistency, measured with Chronbach a, was. 65 [31].
- The psychosocial development was assessed with the teacher version of the Strengths and Difficulties Questionnaire (SDQ-Hel) [33,34] in Greek. It is a structured questionnaire that assesses the strengths and difficulties of the students and their adaptation to the school and wider social environment. In the present study, we used the short form of the questionnaire for assessing individuals 4-17 years old. The SDQ-Hel contains 25 statements, classified under five subscales: Conduct Problems, Emotional Problems, Hyperactivity-Inattention, Peer Problems and Prosocial Behavior. Teachers are asked to rate each statement describing the child's behavior in a three-point scale, ranging from 1 to 3 (1: "Not Applicable", 2: "Somewhat Effective" and 3: "Very Effective"). According to Bibu-Nakou., *et al.* [34], the subscales of Emotional Problems and Peer Problems can be grouped in the broader category for internalized problems. Similarly, the subscales of Hyperactivity-Inattention and Conduct Problems may be grouped in a broader subscale named externalizing problems. The first four subscales (Conduct Problems, Emotional Problems, Hyperactivity- Inattention, and Peer Problems) are aggregated and represent the overall difficulty level, while the latter (Prosocial Behavior) represent the positive social behavior. Bibou-Nakou., *et al.* [34] reported moderate to high reliability coefficients for the parent, teacher and student versions of the SDQ-Hel, ranging from. 67 to. 86. A demographic questionnaire was used in the present study to collect information with respect to the participant's age / grade, gender, hearing loss, communication (signed, oral, combined), use of a hearing aid or cochlear implant, acoustic parental status , athletic experience and years of involvement with sports.

Procedure

The Greek Ministry of Education approved the research protocol and offered the permission to visit the schools and conduct the study. Accordingly, the primary researcher visited the schools, met with the principles, explained the purposes of the study and asked for their permission to proceed. The teachers were approached next and finally the students. The teachers in the special schools were all fluent in sign language and had a minimum of two years of teaching experience with deaf students. The participation for teachers and students was voluntary, and informed consents were necessary for teachers, students and their respective parents. The assessments were administered anonymously and coded. The primary researcher was responsible for the data collection, and the teachers were present during the process. The paper-pencil assessments were administered in a random order, to avoid carry over effect, during the daily schedule at school (10 to 13:00 a.m).

The assessment of motor development was conducted in the school's gym, or in multipurpose spaces used for the physical education class, after suitable adjustments and according to the instructions included in the package manual (BOT-2) [28]. The 14 tasks were assessed in the order presented in the manual, individually, and lasted approximately 15-20 minutes (depending on the age and functionality). The BOT-2 was assessed in the presence of the physical educator employed, who was there to assist and facilitate the whole process (10 to 13:00 a.m.).

The 28 pictures of the RMET were presented on a computer screen, separate for each student, in a pre-determined sequence. The students were observing the pictures and red aloud or signed

the four available responses in each one of them. Finally, they provided orally (or signed) their responses, for each picture separate.

A pilot study was conducted, with a sample of 10 students with D/HH, in the wider area of Athens. The objective was the familiarization with a) the data collection process, b) the acquaintance with the school principles, staff and students and c) the detection of difficulties which may arise during the process. No difficulties were recorded during the pilot testing, and the researchers assumed they were ready to proceed in the main part of the study.

Statistical analyses

The SPSS v20 for windows was used for statistical analyses. Descriptive statistics were estimated for the whole sample and separate for the two groups (with and without D/HH). Pearson correlation coefficients and multiple regression analyses were used to assess the relationships among the dependent variables (motor development, ToM, empathy, strengths and difficulties). The following criteria of Cohen [35] were used for evaluating the intercorrelations: low (<.20), low-moderate (.20 to.30), moderate (.31 to.50) and moderate-high (>. 50). With respect to the multiple regression analysis, motor development served as the criterion variable, while ToM, empathy, and strengths and difficulties served as the predictor variables. Multicollinearity was examined with the Tolerance and VIF (variance inflation factor) diagnostic factors. Indices of <.10 for Tolerance and > 10 for VIF were used as the cut-off criteria to assess the presence of multicollinearity among the predictors [36,37].

The Cronbach a coefficient was used to examine the internal consistency [38]. The differences between students with and without D/HH in the dependent variables were examined with multivariate and univariate analyses. The Levene test, Box M and Bartlett test of Sphericity evaluated the conditions for the multivariate analyses [38]. With respect to the univariate analyses, the Least Significant Difference (LSD) method with Bonferroni adjustment was used for post hoc comparison [39].

Accordingly, the differences between students with high vs low ToM scores in motor development, SDQ-Hel and empathy were examined. The split half method was used for that purpose, based on the 50% criterion [40,41] that divided the participants into high (above 50%) and low groups (below 50%) based on the respective ToM median score. The initial level of statistical significance was set at an alpha level of .05.

Results

Students answered to the empathy scale, the ToM, and were assessed in motor development. The teachers assessed the strengths and difficulties of their students with the SDQ-Hel scale. The results are presented in tables 2 and 3.

Variable	M	SD	N
SDQ-Hel			
SDQ1:Emotional problems	1.74	1.79	58
SDQ2: Conduct problems	1.41	1.81	58
SDQ3: Hyperactivity- Inattention	3.31	2.77	58
SDQ4: Peer problems	2.50	1.85	58
SDQ5: Prosocial behavior	8.21	1.84	58
Empathy	13.90	3.54	58
ToM	15.46	4.01	58
BOT-2	61.77	11.17	58

Table 2: Descriptive Characteristics of the students with and without D/HH.

Reliability analysis

The Cronbach alpha was used to provide reliability evidence. With respect to the SDQ-Hel, the coefficients ranged from. 60 (emotional problems) to. 85 (hyperactivity- inattention). The results, for the SDQ-Hel subscales, the ToM, empathy and BOT-2 are presented in table 4.

Variable	Cronbach's a
SDQ1: Emotional problems	.60
SDQ2: Conduct problems	.71
SDQ3: Hyperactivity- Inattention	.85
SDQ4: Peer problems	.66
SDQ5: prosocial behavior	.72
Empathy	.67
ToM	.62
BOT-2	.81

Table 4: Cronbach alpha reliability coeffecients for students with and without D/HH.

The intercorrelation among the dependent variables, for the whole sample (with and without D/HH), were examined. The statistical analyses revealed significant intercorrelations among the SDQ-Hel total score, motor development (BOT-2), ToM and empathy, and are presented in table 5.

	SDQ-Hel	Empathy	ToM	BOT-2
SDQ-Hel	1	-.363 **	-.272 *	-.313 *
Empathy		1	.669 **	.754 **
ToM			1	.818 **
BOT-2				1

Table 5: Intercorrelations among empathy, ToM, SDQ-Hel and motor development of students with and without D/ HH ** p <0.01, * p <0.05.

Accordingly, the respective intracorrelations were examined, separate for students with and without D/HH. The results for each group are presented in tables 6 and 7.

	SDQ-Hel	Empathy	ToM	BOT-2
SDQ-Hel	1	-.513 **	-.116	-.464 *
Empathy		1	.580 **	.675 **
ToM			1	.615 **
BOT-2				1

Table 6: Intercorrelations among empathy, ToM, SDQ-Hel and motor development (BOT-2) of students with D/HH * p<0.05, ** p <0.01.

	SDQ-Hel	Empathy	ToM	BOT-2
SDQ-Hel	1	-.044	-.329	-.005
Empathy		1	.168	.371 *
ToM			1	.197
BOT-2				1

Table 7: Intercorrelations among empathy, ToM, SDQ-Hel and motor development (BOT-2) of students without D/HH * p<0.05.

A stepwise multiple regression analysis was conducted to predict motor development (criterion variable) from ToM, empathy and SDQ-Hel, for the whole sample. Tolerance and VIF diagnostic indices were of appropriate range, providing support for the multiple regression analysis. The results revealed that empathy and ToM significantly predicted the student's motor development (R^2= .747 and p= .000) (F= 81.45, p= .000). The final prediction equation was as follows: BOT-2 = 20.898 + 1.583 * $X1_{(ToM)}$ + 1.180 * $X2_{(Empathy)}$.

Accordingly, the differences between students with and without D/HH in BOT-2 (motor development), empathy, ToM and the SDQ-Hel subscales were examined. With respect to the BOT-2 scores, the results were significant (t= -10.494, p= .000) and are presented graphically in figure 1.

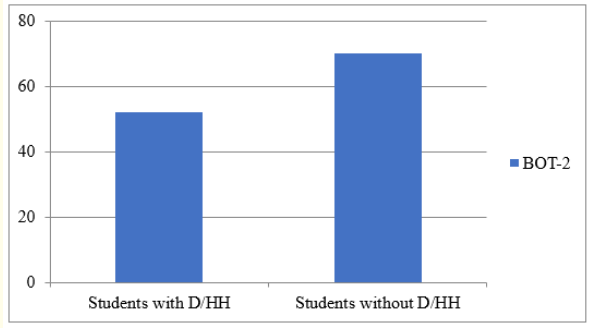

Figure 1: Differences in motor development between students with and without D/HH.

With respect to empathy, the results were significant (t= -5.366, p= .000) and are graphically presented in figure 2.

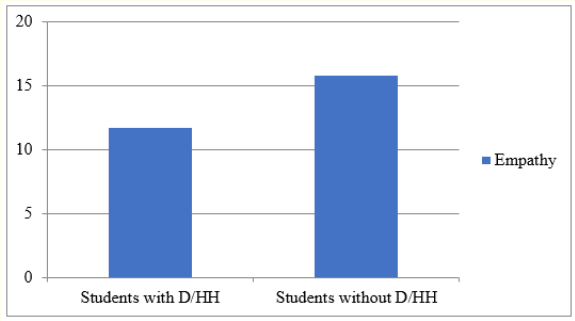

Figure 2: Differences in Empathy between students with and without D/HH.

Significant differences were found with respect to the ToM scores (t= -10.815, p= .000) and are presented in figure 3.

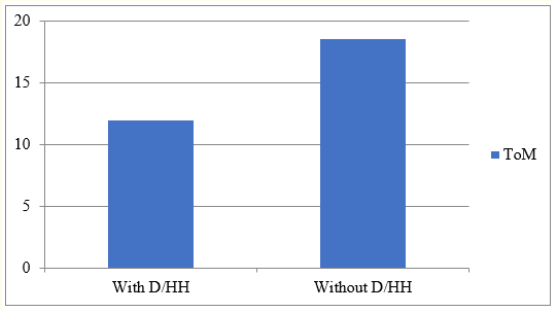

Figure 3: Differences in ToM between students with and without D/HH.

With respect to the total SDQ-Hel score, the results revealed no significant differences (t= 1.376, p= .174). Regarding the five SDQ-Hel subscales, the Levene test, Box M and Bartlett test of Sphericity were at the appropriate range. Accordingly, the multivariate results revealed no significant differences (Λ= .908, F= 1.048, p= .400, η^2= .092). The univariate post hoc analyses revealed no significant differences for Emotional Problems (F= 0.769, p= .384, η^2= .014), Conduct Problems (F= 1.308, p= .258, η^2= .023), Hyperactivity-Inattention (F= .116, p= .734, η^2= .002), Peers Problems (F= 3.889, p= .054, η^2= .065), and Prosocial Behavior (F= 1.905, p= .173, η^2= .033) figure 4.

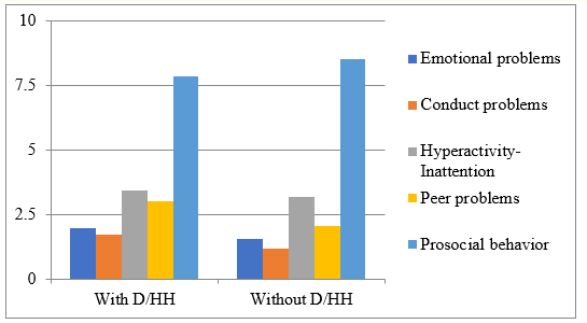

Figure 4: Differences in the SDQ subscale between students with and without D/ HH.

Finally, we examined the differences between students with high vs low ToM scores in motor development, SDQ-Hel and empathy. The split half method was used for that purpose, based on the responses in the ToM scale of the whole sample. The split half method separated the students in two groups, according to their ToM median score: a) students with scores equal or above 16, and b) students with scores equal to or less than 15. The assessments of students with high and low ToM scores are shown in table 8.

	Low ToM N = 27		High ToM N = 31	
Variable	**M**	**SD**	**M**	**SD**
SDQ1: Emotional Problems	2.04	2.06	1.48	1.50
SDQ2: Conduct Problems	1.89	1.97	1.00	1.57
SDQ3: Hyperactivity- Inattention	3.67	2.64	3.00	2.89
SDQ4: Peers Problems	3.11	1.91	1.97	1.64
SDQ5: Prosocial Behavior	7.93	2.05	8.45	1.63
SDQ-Hel	10.70	6.30	7.45	5.29
Empathy	11.41	3.21	16.06	2.11
BOT-2	52.37	8.48	69.97	5.10

Table 8: Differences between students with high and low ToM scores in the SDQ-Hel, empathy and BOT-2.

The multivariate results were not statistically significant (Λ= .875, F= 1.892, p= .125, η^2= .125) relative to the SDQ-Hel subscales, between students with high vs low ToM scores. The univariate post hoc analyses revealed no significant differences for Emotional Problems (F= 1.384, p= .244, η^2= .024) and Hyperactivity-Inattention (F= .831, p= .366, η^2= .015). The results approached statistical significance for Conduct Problems (F= 3.656, p= .061, η^2= .061) and were significant for Peer Problems (F= 6.015, p= .017, η^2= .097).

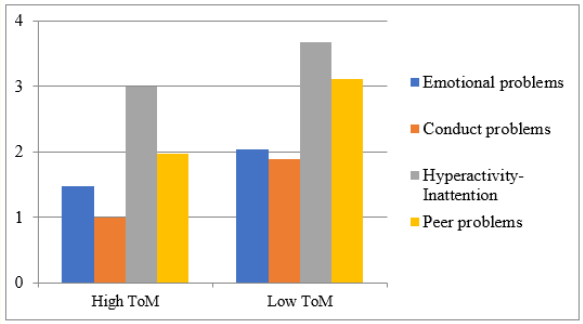

Figure 5: Differences in high vs low ToM in the SDQ-Hel subscale.

Regarding the Prosocial Behavior subscale, there were no significant differences between the two groups (t = 1.086, p = .282). With respect to the total SDQ-Hel score, there were significant differences between the two groups. Specifically, students with low ToM had significantly higher scores in SDQ-Hel total score. Regarding motor development, there were significant differences between the two groups. Students with high ToM had higher motor development scores (t= 9.719, p= .000) compared to students with low ToM.

Finally, we examined the differences in the number of students with and without D/HH, who had either high or low ToM scores. The chi-square analysis was used for that purpose, while the Standardized Residuals were used (>+ 2) as post hoc analyses [39]. The results were statistically significant (χ^2= 43.038, p= .000) and are presented in Table 9.

	Low Tom	High Tom	
With D/HH	Obs: 25 Exp: 12.6 Std Residual: 3.5	Obs: 2 Exp: 14.4 Std Residual: -3.3	27
Without D/HH	Obs: 2 Exp: 14.4 Std Residual: -3.3	Obs: 29 Exp: 16.6 Std Residual: 3.1	31

Table 9: Differences in the number of students with and without D/HH, with either high or low ToM scores.

Examination of the Standardized Residuals revealed that there were far fewer students observed with D/HH than those expected with high ToM scores. In addition, there were more students with D/HH and low ToM scores than those expected. The opposite was found for students without D/HH. Specifically, more students without D/HH had high ToM scores than those expected. Similarly, less students without D/HH had low ToM scores compared to those expected figure 6.

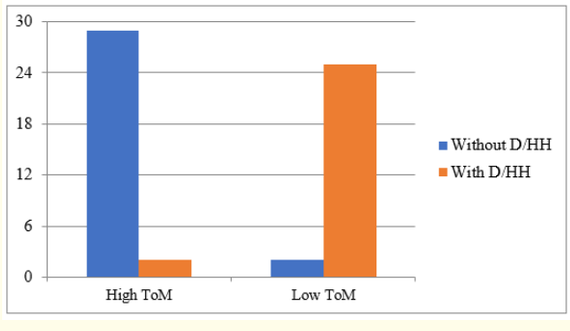

Figure 6: Differences in the number of students with and without D/HH with either high or low ToM.

Discussion and Conclusion

The present study examined the association among the motor development, empathy, theory of mind (ToM) and the strengths and difficulties of elementary school children with and without D/HH. In an attempt to support previous results and establish the validity of the present findings, the differences between children with and without D/HH in empathy, ToM and motor development were examined as well. A holistic approach of human development was introduced for the purposes of the study [2,19,42]. Within this general developmental framework, the motor skills exhibited by children are important for their psychosocial development, relationships among peers and their general self-esteem [42]. According to Hartman, Houwen and Visscher children with D/HH often experience restrictions in their psychosocial, language, motor and cognitive development. These restrictions, associated with the under-development of motor skills, may have an adverse effect upon their overall psychosocial and cognitive skills and the attainment of meaningful lifelong experiences through engagement in physical activity, sports, and healthy lifestyle activities in general [43].

The present findings confirmed the research hypotheses since a) the intercorrelations among the assessments were significant and b) motor development was predicted from empathy and ToM scores. Further, a greater number of D/HH students, compared to their non D/HH counterparts had low ToM scores, while a greater number of non D/HH students, compared to their D/HH counterparts had high ToM scores. Finally, students with D/HH had lower scores in motor development, ToM and empathy, compared to their counterparts without D/HH, while no differences were recorded with respect to the strengths and difficulties they experience at school.

The present findings are in agreement with Peterson [44] who claimed that empathy and ToM are important for human social life and interpersonal relationships. Specifically, Peterson [44] explored the association between ToM and empathy [44] and found that empathy and ToM correlated significantly for deaf children but not for normal hearing. The researchers claimed that understanding the ToM delays in children with deafness is important, since it is related to different patterns of growth [44]. Further, Wiefferink, Rieffe, Ketelaar, Raeve and Frijns studied the social and emotional skills of children 2.5 to 5 years with cochlear implant (CI). The researchers concluded that the hearing loss affect the understanding of emotions even when expressed by non-verbal ways (Wiefferink., *et al.* 2012) The present findings are in conflict with Ketelaar, Rieffe, Wiefferink and Frijns [45] who examined the social competence and empathetic behavior of children with CI and children without D/HH. The researchers found that empathy and social competence in children with CI and children without D/HH were similar [45]. Peterson, Wellman and Liu reported that children, from

deaf parents, who use sign language develop an understanding of ToM similar to hearing children. Peterson, Wellman and Slaughter (2012) suggested that the communication and the exchange of views among family members through a common language (sign language or oral) may lead to the attainment and overall understanding of empathy and ToM [46].

Concerning the differences between students with and without D/HH, the present findings are consistent with Fait [47] who claimed that children with D/HH often experience restrictions in balance. Gheysen, Loots and Van Waelvelde [48] stated that normal-hearing children had higher scores in motor development compared to deaf, with and without CI. Similar evidence were reported by Hartman, Houwen and Visscher (2011) who evaluated the motor performance of deaf and normal hearing children. Hartman., *et al*. [43] stated that deaf children experience motor restrictions more often, compared to normal hearing children.

With respect to the psychosocial attributes examined (empathy, ToM, strengths and difficulties), the present findings are in accordance to Dammeyer [49] who found that only the D/HH children with advanced language skills (sign language and oral) exhibited no particular psychosocial difficulties and were assimilated to their normal hearing counterparts [49]. Netten., *et al*. [16] compared D/HH preadolescents with normal hearing in empathy and the association between empathy to language development and hearing loss characteristics. The researchers found that the D/HH children had lower cognitive empathy and pre-social motive than non deaf children, regardless of the type of hearing aid [16].

In summary, most studies agree that the D/HH children, usually from deaf families, experience delays in motor development, several psychosocial attributes, and the development of ToM [46,50] In fact, they often continue to fail in several assessments of the ToM, from preschool to middle childhood and later in life [46,50]. The present results are mainly in agreement with the above researchers and confirm the validity of the study.

Limitations

The present findings are subjected to certain limitations which do not allow for generalization without caution. First, empathy and ToM were assessed through survey self-report questionnaires. In addition, information on the psychosocial development of the students involved (strengths and difficulties) were taken from proxy reports from their teachers. Second, the sample size was not supported from power analysis and consisted of a convenient sample of students from two general and two special schools in Attica, in the wider area of Athens. Third, the D/HH sample was limited to students without any comorbid conditions, according to their school files. Fourth, data collection procedure differed, since the D/HH sample was examined through either oral, sign language or both. Fifth, comparison between the two groups was based on hearing loss (with and without D/HH). No differences were examined with respect to the onset of hearing loss (prelingual, postlingual), the communication modes (sign, oral, combined), the hearing loss of parents and the devices (cochlear implant, hearing aid) used. The D/HH sample however was limited and the majority of the students (96.43%) were living with their hearing parents. It was not feasible therefore to conduct separate regression analyses for D/HH students with CI (N=8), hearing aid (N=6), combined CI and hearing aid (N=3), prelingual (N=23), postlingual (N=4), using sign language (N=9) or combination of oral and sign language (N=18) etc. Finally, motor development was predicted solely from certain psychosocial variables (ToM and empathy). The holistic approach [2] however lies in the philosophy that the children attain the developmental skills in all areas (cognitive, communication, motor, psychosocial) through playing. In the present study however, the research team had no access to data concerning the student's cognitive skills, which, in turn, were not used in the multiple regression analysis for the prediction of motor development.

Recommendations for future studies

Future studies may incorporate wider and more representative samples in Greece and examine the respective association among motor and psychosocial development, ToM and empathy, separate for student who differ according to their parents hearing loss, onset of hearing loss, communication modes, devices used, etc. Qualitative in-depth methods of data collection, through interviews and observation methods may be useful in the future to study more in depth the association among the motor development, ToM, and empathy of students with and without D/HH. Further, the prediction of motor development may be examined through the psychosocial, communication and cognitive skills in the future.

Longitudinal studies may assess the association among ToM, empathy, SDQ, motor development, cognition and communication

modes for individuals with and without D/HH. Future researchers may consider the implementation of holistic intervention programs aiming towards the development of motor, cognitive, communication and psychosocial skills. The research findings in this case may be useful to other 'groups' of students, such as children with learning disabilities, chronic diseases, intellectual disabilities, etc. Intervention programs may need constant adaptations and re assessments to determine whether or not the improvement of students during the school year is feasible and sustained.

Recommendations for practitioners

The present findings raise few concerns regarding the educational curriculum and its effect on the motor and psychosocial development of students with D/HH. The general and special education teachers may need to review their curriculum and the content of the courses they teach. Additional courses and seminars organized to include internships, aimed at all-round and effective preparation and awareness of future special education teachers seem helpful. Even more, educational interventions may start during the preschool years, when children have a wide potential to improve [19]. Educators in general may need to familiarize themselves with assessments of motor, psychosocial and cognitive development. These assessments may guide their attempts to maximize their student's potential. Overal, the development of holistic programs, for the development of motor, cognitive, communication and psychosocial skills, based upon the individual profile of the D/HH students seem essential for maximizing their long term potential.

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