

Interrelation of Dental Fear and Anxiety with the Morphology of Hand-Writing and Hand-Drawing of Children

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Abstract

Interrelation of dental fear related scale scores and anxiety related scores with several morphological parameters of hand-drawings and hand-written free associations (couplings) as to the teeth were analyzed on children (n = 245). Dental fear scores interrelated with torque, line quality, detailing, closeness/openness, and appearance of certain content (upper/lower tooth or illustration of root) of drawings and space between the words, conscious space between the lines, average space between the lines, right margin, upper margin, zone height corrected lower zone and letter width of writings. Anxiety scores interrelated with shape, line quality, closeness/openness and appearance of content like root illustration of drawings and right margin, upper margin, letter size corrected upper zone, zone height corrected upper zone and zone height corrected lower zone. There were differences depending on that, which particular scale was used, and also between “drawing preference” or “writing preference” groups comparing to “no preference” group.

Key Words: dental fear, anxiety, drawing, writing, children, graphology

1. Introduction

Dental fear and anxiety is an increasing problem for dentistry even if techniques and methods for dental anesthesia and sedation improved strongly in the last decades [9, 10]. Therefore, research related to dental fear and anxiety in dentistry including their screening, diagnosis, treatment and deeper understanding is strongly needed, especially for children and adolescents. Morphological analysis of hand-drawings and hand-written free associations (couplings) as to the teeth may be a good tool for the understanding of deeper psychological processes behind the phenomena of dental fear and anxiety [16, 3, 8, 1, 5].

In our previous studies mean dental fear (DAS, DFS) scores, Expectation Scale (ExP) scores and anxiety (STAI-S, STAI-T) scores of Hungarian children as well as certain psychosymbolic content of their drawings and free associations (couplings) were studied [8, 19, 7, 13]. A detailed analysis of hand-drawings but not hand-writing of disabled children was also done previously [1].

However, *detailed morphology of hand-drawings and hand-writings and their interrelations with dental fear and anxiety values of not disabled children was not yet analyzed.* The aim of this study was to analyze data in this respect.

2. Methods

Hungarian primary and grammar school subjects from Budapest participated in this study ($n = 277$, 114 females, 163 males; age between 8 and 18 years, mean 13.97 ± 2.77 years) [8]. The subjects participated voluntarily, after the appropriate information about the study had been given. Agreements of the students' parents were also obtained [21]. Dental fear was measured by the Hungarian versions [11, 12] of the Dental Anxiety Scale (DAS, [4]) and the Dental Fear Survey (DFS; [14, 15]). To measure the subjects' expectations in terms of dental fear of their surrounding people (parents, brother, sister, friends) the Expectation Scale (ExP; [6, 8]) was used. To measure anxiety level the Hungarian version [17] of Spielberger's State and Trait Anxiety Inventory (STAI-S, STAI-T; [18]) was used.

Following administration of the scales subjects were asked to make drawings and free associations (couplings) as to the teeth as previously described [8, 19, 1]. Briefly: for hand-drawings a 15 x 15-cm square on a sheet of paper was used, and the participant was asked to draw a tooth (or teeth) in it [8, 19, 1]; for hand-writing free associations (couplings), another sheet of paper was given and the participant was asked to write any thoughts that came into his/her mind about teeth [8, 7, 13]. Subjects were allowed to follow their preference to participate in both drawing and writing task, or to participate in one of them only or not to participate any of them. Those participated in drawing task only was considered as "drawing preference" group ($n = 74$); those participated in writing task only was considered as "writing preference" group ($n = 51$); whereas those participated in both tasks were considered as "no preference" group ($n = 120$). Subjects participated neither in drawing task nor in writing task ($n = 32$) were excluded from this study.

Following the collection of data, scales (or survey and inventories) were evaluated as usual. Chronbach alpha values and whole sample mean scores ($n = 277$) of the scales were published previously [8]. Premised values were as follows [8]: Chronbach alpha values of the scales were DAS: 0.86; DFS: 0.92; ExP: 0.81, STAI-S: 0.89, STAI-T: 0.87. Mean scores of the whole sample were: [8]: DAS: 10.8 ± 3.6 ; DFS: 40.6 ± 15.6 ; ExP: 2.4 ± 0.9 ; STAI-S: 38.0 ± 11.0 ; STAI-T: 40.3 ± 10.0 [8].

The morphology of hand-drawings and the hand-writings (i.e. written free associations) were evaluated by two investigators working independently, but consulting with each-other if dubious cases of categorization appeared. In case of hand-drawings fourteen (formal, structural or content) parameters were analyzed similarly as previously [1] including analysis of type, shape, size, localization, size, symmetry, torque, line quality, line length, shading, detailing, closeness/openness of the drawing as well as whether it was an upper or a lower tooth and if it had roots or not [1]. Evaluating the written free associations fourteen basic grapho-analytical parameters were administered. Eight of them are in connection with the body of the text, including space between the words, conscious space between the lines, average space between the lines, conscious left margin, minimum left margin, average left margin, right margin, upper margin. [20]. Six parameters are related to the letters such as letter size-corrected upper zone, letter size-corrected lower zone, zone height-corrected upper zone, zone height-corrected lower zone, letter width and large initial height. [2]. For statistical analysis, the "Statistica 11" software (Stat Soft, US) was used, the minimal level of significance was $p \leq 0.05$.

3. Results

Mean scores, age and gender distribution of the groups are shown in *Table 1*. Mean age of "drawing preference" group was somewhat higher comparing to the other groups (one-way ANOVA, age \Leftrightarrow groups: $p \leq 0.01$). There was no other group related difference found within data of Table 1 (one-way ANOVA, DAS \Leftrightarrow groups: n.s., DFS \Leftrightarrow groups: n.s., ExP \Leftrightarrow groups: n.s., STAI-S \Leftrightarrow groups: n.s., STAI-T \Leftrightarrow groups: n.s.).

Morphological parameters of hand-drawings of “drawing preference” group are summarized in *Table 2*. Data indicate that DAS related to 1 parameter, both STAI-S and STAI-T values related to 2 parameters, whereas ExP related to 3 and DFS related to none of the parameters.

Morphological parameters of hand-writing of “writing preference” group are summarized in *Table 3*. Data indicate that DAS, DFS, and ExP related to 2 parameters each, STAI-S related to 3 parameters whereas STAI-T related to none of the parameters.

Morphological parameters of hand-drawing and hand-writing of the “no preference” group are summarized in *Table 4/a*. and *Table 4/b* respectively. In the case of drawings (*Table 4/a*), data indicate that both DAS and STAI-T related to 1 parameter, ExP related to 2 parameters, DFS related to 3 parameters, whereas STAI-S related to none of the parameters. In the case of writings (*Table 4/b*) data indicate that, STAI-S related to 1 parameter, both DAS and STAI-T related to 2 parameters, whereas DFS and ExP related to none of the parameters.

Dental fear related drawing parameters are summarized in *Table 5*. As data indicate, numerous drawing parameters are related to one or the other of the dental fear related scales. However there is huge difference between the “drawing preference” and the “no preference” group in this relation. Surprisingly, there is only one parameter which appears in the case of both groups. There are also huge differences between the parameters being interrelated with the different dental fear related scales (i.e. DAS DFS and ExP).

Dental fear related writing parameters are summarized in *Table 6*. There are also numerous writing parameters which are related to one or more dental fear related scales. However the huge difference between the “writing preference” and the “no preference” group is even more obvious in this case. Very few dental fear related parameter appear in the case of “no preference” group, and there is no parameter which appears in the case of both groups. There are huge differences between the parameters being interrelated with the different dental fear related scales (i.e. DAS DFS and ExP) also in this case.

Anxiety related drawing parameters are summarized in *Table 7*. As data indicate, number of drawing parameters being related to one or the other of the dental fear related scales is somewhat lower comparing to the number of those being related to dental fear. The huge difference between the “drawing preference” and the “no preference” group is obvious also in this relation. There is only one parameter which appears in the case of both groups. There is also a difference between the parameters related to state (STAI-S) or trait anxiety (STAI-T).

Anxiety related writing parameters are summarized in *Table 8*. Number of drawing parameters being related to one or the other of the dental fear related scales is somewhat lower comparing to the number of those being related to dental fear also in this case. The huge difference between the “writing preference” and the “no preference” group also appears in this case. There is only one parameter which appears in the case of both groups, and there is also a difference between the parameters related to state or trait anxiety (i.e. STAI-S, STAI-T).

4. Conclusion

There are numerous morphological parameters of hand-drawings and hand writings which are interrelated with the dental fear and anxiety scores in this study. There are huge differences in relation to that, which particular dental fear related or anxiety related scale was used. There is also huge difference between the “drawing preference” and “writing preference” groups comparing to the “non preference” group. Taking together all these data, authors may conclude that, drawing and writing parameters measured in this study are not suitable for diagnostic or screening purposes neither in relation to dental fear nor in relation to anxiety, because they are somewhat uncertain. However, it may not be excluded that, another morphological parameters of hand-drawing/writing may be found, which could be used for such purposes (may be in combination with one or the other of the parameters measured in this study). The huge difference between the drawing/writing preference groups comparing to the no preference group may be of scientific interest as well.

5. References

Beck, A., Molnár, E., Fejérdy, P., & Fábíán, T. K. (2010). Effect of being disabled, dental fear and anxiety on drawings. [In Hungarian: Adatok fogyatékkal élők fogászati félelem és szorongás értékeiről, valamint embert, szájat illetve fogat ábrázoló rajzairól]. *Fogorvosi Szemle*, 103, 131-139.

- Budavári, Zs., Szidnai, L., & Urbán, G. (1998). Basic principles of graphology [In Hungarian: A grafológiai mérés alapfogalmai]. In T. Agárdy, & L. Szidnai (Eds.), Handbook of graphology [In Hungarian: A grafológia kézikönyve] (pp 271-284). Budapest: Grafológiai Intézet.
- Carroll, M. K., & Ryan-Wenger, N. A. (1999). School-age children's fears, anxiety, and human figure drawings. *Journal of Pediatric Health Care*, 13, 24-31.
- Corah, N. L. (1969). Development of a Dental Anxiety Scale. *Journal of Dental Research*, 48, 596.
- Daglioglu, H. E., Deniz, Ü., & Kan, A. (2010). A study on the emotional indicators in 5-6 year-old girls' and boys' human figure drawing. *Procedia Social and Behavioral Sciences*, 2, 1503-1510.
- Fábián, G., Fejérdy, L., Fábián, Cs., Kaán, B., Gáspár, J., & Fábián, T.K. (2003). Dental fear scores of 8-15 years old primary school children in Hungary [In Hungarian: Fogászati kezeléstől való félelem epidemiológiai vizsgálata általános iskolás (8-15 éves) korcsoportban]. *Fogorvosi Szemle*, 96, 129-133.
- Fábián, G., Fejérdy, L., Kaán, B., Fábián, Cs., Tóth, Zs., & Fábián, T. K. (2004). Background data about the high dental fear scores of Hungarian 8-15-year-old primary school children [In Hungarian: Adatok általános iskolás (8-15 éves) gyermekek fogászati kezeléssel kapcsolatos félelmeinek háttéréről]. *Fogorvosi Szemle*, 97, 128-132.
- Fábián, G., Müller, O., Kovács, Sz., Nguyen, M. T., Fábián, T. K., Csermely, P., & Fejérdy, P. (2007). Attitude toward death: does it influence dental fear? *Annals of the New York Academy of Sciences*, 1113, 339-349.
- Fábián, T.K., & Fábián, G. (1998). Stress of life, stress of death: anxiety in dentistry from the viewpoint of hypnotherapy. *Annals of the New York Academy of Sciences*, 851, 495-500.
- Fábián, T. K., Fábián, G., & Fejérdy, P. (2007). Dental Stress. In G. Fink (Ed-in-chief), *Encyclopedia of stress*. (2nd ed.) (pp 733-736). Oxford: Academic press.
- Fábián, T. K., Kelemen, P., & Fábián, G. (1998). The Hungarian translation of the "Dental anxiety Scale". Epidemiological studies on Hungarian population [In Hungarian: A Dental Anxiety Scale ("Fogászati Szorongáskála") hazai bevezetése. Magyar populáción végzett fogászati szorongás-epidemiológiai vizsgálatok]. *Fogorvosi Szemle*, 91, 43-52.
- Fábián, T.K., Handa, T., Szabó, M., Kelemen, P., Kaán, B., & Fábián, G. (1999). The Hungarian translation of the "Dental Fear Survey". Epidemiological studies [In Hungarian: A "Dental Fear survey" (a "Fogászati félelem kérdőív") Magyar fordítása, hazai populáción végzett mérések eredményei]. *Fogorvosi Szemle*, 92, 307-315.
- Fejérdy, L., Kaán, B., Fábián, G., Tóth, Zs., & Fábián, T.K. (2005). Background data about the high dental fear scores of Hungarian secondary school students [In Hungarian: Adatok budapesti középiskolások fogászati kezeléssel kapcsolatos félelmeinek háttéréről]. *Fogorvosi Szemle*, 98, 9-13.
- Kleinknecht, R. A., Klepach, R. K., & Alexander, L. D. (1973). Origins and characteristics of fear of dentistry. *Journal of the American Dental Association*, 86, 842-848.
- Kleinknecht, R. A., Thorndike, R. M., McGlynn, F. D., & Harkavy, J. (1984). Factor analysis of the Dental Fear Survey with cross-validation. *Journal of the American Dental Association*, 108, 59-61.
- Peeples, E. E., & Retzlaff, P. (1993) Personality traits and handwriting characters: male and female college students. *Journal of Personality and Individual Differences*, 15, 341-342.
- Sipos, K., & Sipos, M. (1978). The development and validation of the Hungarian form of the STAI. In Spielberger, C.D. & R. DiazGuerro (Eds.), *Cross-cultural anxiety* (pp. 51-61). Washington and London: Hemisphere Publishing Corporation.
- Spielberger, C.D., Gorsuch, R. L., & Lushene, R. E. (1970). *Manual for the Strait-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologist Press.
- Tóth, Zs., Fejérdy, L., Fábián, Cs., Kaán, B., Müller, O., & Fábián, T. K. (2006). Initial analysis of tooth drawings of 8-18 years old schoolchildren from normal population [In Hungarian: Fogat ábrázoló rajzok alapparamétereinek vizsgálata normál populáción, 8-18 éves korcsoportban]. *Fogorvosi Szemle*, 99, 47-52.
- Urbán, G., Budavári, Zs., Szidnai, L. Variables of spacing [In Hungarian: A térkitöltés változói] (1998). In T. Agárdy, & L. Szidnai (Eds.), Handbook of graphology [In Hungarian: A grafológia kézikönyve] (pp 285-362). Budapest: Grafológiai Intézet.
- World Medical Association. (2001). World Medical Association Declaration of Helsinki. Ethical principles for medical research involving human subjects. *Bulletin of the World Health Organization*, 79, 373-374.

Table 1. Gender distribution, age distribution and mean scores of the groups and the whole sample

	n=	Male	Female	Age	DAS	DFS	ExP	STAI-S	STAI-T
Drawing pref.	74	34	40	14,67 ±1,82	10,24 ±3,39	38,20 ±13,84	2,51 ±0,8	38,41 ±10,7	39,21 ±9,29
Writing pref.	51	19	32	13,21 ±3,21	10,7 ±3,87	41,43 ±17,29	2,34 ±0,83	38,05 ±10,8	39,88 ±11,14
No pref.	120	48	72	13,34 ±2,9	10,97 ±3,73	41,05 ±15,25	2,34 ±0,86	37,7 ±11,76	40,69 ±10,29
Total	245	101	144	13,71 ±2,76	10,69 ±3,66	40,36 ±15,28	2,39 ±0,84	37,99 ±11,23	40,07 ±10,16

DAS: Dental Anxiety Scale; DFS: Dental Fear Survey; ExP: Expectation Scale; STAI-S: Spielberger's Anxiety Scale State Version; STAI-T: Spielberger's Anxiety Scale Trait Version, Drawing pref.: drawing preference group; Writing pref.: writing preference group; No pref.: no preference group; n=: number of subjects

Table 2. Interrelation of drawing parameters with dental fear and anxiety in the "drawing preference" group (one-way ANOVA, + = $p < 0,05$; ++ = $p < 0,01$; - = not significant; n=74; 34 male, 40 female, mean age: 14,67±1,82)

	DAS	DFS	ExP	STAI-S	STAI-T
Type	-	-	-	-	-
Shape	-	-	-	+	-
Size	-	-	-	-	-
Location	-	-	-	-	-
Greatness	-	-	-	-	-
Symmetry	-	-	-	-	-
Torque	-	-	+	-	-
Line quality	-	-	++	-	+
Line length	-	-	-	-	-
Shading	-	-	-	-	-
Detailing	++	-	++	-	-
Closeness or openness	-	-	-	-	++
Upper or lower tooth	-	-	-	-	-
Illustrate root or not	-	-	-	++	-

DAS: Dental Anxiety Scale; DFS: Dental Fear Survey; ExP: Expectation Scale; STAI-S: Spielberger's Anxiety Scale State Version; STAI-T: Spielberger's Anxiety Scale Trait Version; n=: number of subjects

Table 3. Interrelation of writing parameters with dental fear and anxiety in the "writing preference" group (one-way ANOVA, + = $p < 0,05$; ++ = $p < 0,01$; - = not significant; n=51; 19 male, 32 female, mean age: 13,21±3,21)

	DAS	DFS	ExP	STAI-S	STAI-T
Space between the words	-	++	-	-	-
Conscious space between the lines	-	-	+	-	-
Average space between the lines	-	-	+	-	-
Conscious left margin	-	-	-	-	-
Minimum left margin	-	-	-	-	-
Average left margin	-	-	-	-	-
Right margin	+	-	-	++	-
Upper margin	-	-	-	+	-
Letter size corrected upper zone	-	-	-	-	-
Letter size corrected lower zone	-	-	-	-	-
Zone height corrected upper zone	-	-	-	-	-
Zone height corrected lower zone	-	++	-	+	-
Letter width	+	-	-	-	-
Large initial height	-	-	-	-	-

DAS: Dental Anxiety Scale; DFS: Dental Fear Survey; ExP: Expectation Scale; STAI-S: Spielberger's Anxiety Scale State Version; STAI-T: Spielberger's Anxiety Scale Trait Version; n=: number of subjects

Table 4/a. Interrelation of drawing parameters with dental fear and anxiety in the “no preference” group (one-way ANOVA, + = $p < 0,05$; ++ = $p < 0,01$; - = not significant; n=120; 48 male, 72 female, mean age: 13,34±2,9)

	DAS	DFS	ExP	STAI-S	STAI-T
Type	-	-	-	-	-
Shape	-	-	-	-	-
Size	-	-	+	-	-
Location	-	-	-	-	-
Greatness	-	-	-	-	-
Symmetry	-	-	-	-	-
Torque	-	-	-	-	-
Line quality	-	-	-	-	-
Line length	-	-	-	-	-
Shading	-	-	-	-	-
Detailing	+	-	-	-	-
Closeness or openness	-	++	-	-	++
Upper or lower tooth	-	-	+	-	-
Illustrate root or not	-	+	-	-	-

DAS: Dental Anxiety Scale; DFS: Dental Fear Survey; ExP: Expectation Scale; STAI-S: Spielberger's Anxiety Scale State Version; STAI-T: Spielberger's Anxiety Scale Trait Version; n=: number of subjects

Table 4/b. Interrelation of writing parameters with dental fear and anxiety in the “no preference” group (one-way ANOVA, + = $p < 0,05$; ++ = $p < 0,01$; - = not significant; n=120; 48 male, 72 female, mean age: 13,34±2,9)

	DAS	DFS	ExP	STAI-S	STAI-T
Space between the words	+	-	-	-	-
Conscious space between the lines	-	-	-	-	-
Average space between the lines	-	-	-	-	-
Conscious left margin	-	-	-	-	-
Minimum left margin	-	-	-	-	-
Average left margin	-	-	-	-	-
Right margin	-	-	-	++	-
Upper margin	++	-	-	-	-
Letter size corrected upper zone	-	-	-	-	++
Letter size corrected lower zone	-	-	-	-	-
Zone height corrected upper zone	-	-	-	-	+
Zone height corrected lower zone	-	-	-	-	-
Letter width	-	-	-	-	-
Large initial height	-	-	-	-	-

DAS: Dental Anxiety Scale; DFS: Dental Fear Survey; ExP: Expectation Scale; STAI-S: Spielberger's Anxiety Scale State Version; STAI-T: Spielberger's Anxiety Scale Trait Version; n=: number of subjects

Table 5. Dental fear related drawing parameters in the “drawing preference” and “no preference” groups (one-way ANOVA, + = $p < 0,05$; ++ = $p < 0,01$; - = not significant)

	Drawing pref.			No pref.			Both groups		
	DAS	DFS	ExP	DAS	DFS	ExP	DAS	DFS	ExP
Size	-	-	-	-	-	+	-	-	-
Torque	-	-	+	-	-	-	-	-	-
Line quality	-	-	++	-	-	-	-	-	-
Detailing	++	-	++	+	-	-	++/+	-	-
Closeness or openness	-	-	-	-	++	-	-	-	-
Upper or lower tooth	-	-	-	-	-	+	-	-	-
Illustrate root or not	-	-	-	-	+	-	-	-	-

DAS: Dental Anxiety Scale; DFS: Dental Fear Survey; ExP: Expectation Scale; Drawing pref.: drawing preference group; No pref.: no preference group

Table 6. Dental fear related writing parameters in the “writing preference” and “no preference” groups (one-way ANOVA, + = $p < 0,05$; ++ = $p < 0,01$; - = not significant)

	Writing pref.			No preference			Both groups		
	DAS	DFS	ExP	DAS	DFS	ExP	DAS	DFS	ExP
Space between the words	-	++	-	+	-	-	-	-	-
Conscious space between the lines	-	-	+	-	-	-	-	-	-
Average space between the lines	-	-	+	-	-	-	-	-	-
Right margin	+	-	-	-	-	-	-	-	-
Upper margin	-	-	-	++	-	-	-	-	-
Zone height corrected lower zone	-	++	-	-	-	-	-	-	-
Letter width	+	-	-	-	-	-	-	-	-

DAS: Dental Anxiety Scale; DFS: Dental Fear Survey; ExP: Expectation Scale; Writing pref.: writing preference group; No pref.: no preference group

Table 7. Anxiety related drawing parameters in the “drawing preference” and “no preference” groups (one-way ANOVA, + = $p < 0,05$; ++ = $p < 0,01$; - = not significant)

	Drawing pref.		No pref.		Both groups	
	STAI-S	STAI-T	STAI-S	STAI-T	STAI-S	STAI-T
Shape	+	-	-	-	-	-
Line quality	-	+	-	-	-	-
Closeness or openness	-	++	-	++	-	++
Illustrate root or not	++	-	-	-	-	-

STAI-S: Spielberger's Anxiety Scale State Version; STAI-T: Spielberger's Anxiety Scale Trait Version; Drawing pref.: drawing preference group; No pref.: no preference group

Table 8. Anxiety related writing parameters in the “writing preference” and “no preference” groups (one-way ANOVA, + = $p < 0,05$; ++ = $p < 0,01$; - = not significant)

	Writing pref.		No preference		Both groups	
	STAI-S	STAI-T	STAI-S	STAI-T	STAI-S	STAI-T
Right margin	++	-	++	-	++	-
Upper margin	+	-	-	-	-	-
Letter size corrected upper zone	-	-	-	+	-	-
Zone height corrected upper zone	-	-	-	++	-	-
Zone height corrected lower zone	+	-	-	-	-	-

STAI-S: Spielberger's Anxiety Scale State Version; STAI-T: Spielberger's Anxiety Scale Trait Version; Writing pref.: writing preference group; No pref.: no preference group