



Acta Genet Med Gemellol 45: 449-460 (1996)
© 1996 by The Mendel Institute

Field Dependence and Characteristics of Conceptualization in Identical Twins

C. Del Miglio, S. Paluzzi, M. Falanga, M. Talli

Department of Psychology, University of Rome "La Sapienza", Rome, Italy

Abstract. This study falls in the areas of both differential psychology and twin psychology. Using the EFT and the WCST (computerized version), we examined 11 MZFF pairs between 18 and 35 years of age. The aim was to establish the genetic and/or environmental determination of global-analytical cognitive style as well as some characteristics of conceptualization linked to field dependence. The research strategy consisted of introducing three other groups of the same size to control the weight of environmental factors different from those determined by subject selection. The results seem to support the hypothesis of genetic determination of field dependence of the MZFFs, probably linked to the XX chromosome combination. The "couple effect" and the attitude of parents and others toward two identical female subjects may contribute to full expression of the genome. The characteristics of conceptualization revealed by the WCST show that MZFFs persevere in errors typical of a global approach to experience.

Key words: Field dependence, Conceptualization, Couple effect

Differential psychology and twin research

Many theoretical interpretations for explaining the psychological differences between individuals have been traditionally aligned with bio-genetic or socio-environmental determinism without providing adequate explanations about the genesis of the differences and the complex adaptive mechanisms involved in development. In this stagnant situation, current research on twins seems to offer much more than in the past the possibility of investigating the reciprocal influence and modulation of hereditary and environmental factors. This is because of the large quantity of research on the genesis of individual differences [16], which has the advantage of assuming the diachronic changes of cognitive and personological characteristics without ignoring the action of maturational factors; further, it has the advantage of a dynamic and relational perspective required for the study of individual development. It should not be forgotten that each single or twin

born individual constructs itself through comparisons with various environmental opportunities and by making reference to meaningful figures.

The role that twin psychology is able to carry out in the study of the evolution and structuring of psychological differences between individuals is notoriously linked to the fact that some circumstances such as identical genetic patrimony, sharing the same environment during intrauterine life and after birth make identical MZs raised together a “favorite observatory” for research on the genesis of individual differences. In the perspective of general differential psychology, this has to do with the possibility of using research strategies with MZ twins to control the weight of heredity and the environment in various ways. However, studying the differences between MZ twins by focusing attention on the “couple effect” [23], understood as psychic evolution of partners achieved in an interactive way to establish relations and behaviors peculiar to every single pair, produces useful results for clinical purposes but not for differential psychology. This is primarily because even if it is possible to explain the psychological differences between MZs on the basis of the pair structure and the roles played within it [31], it cannot be excluded, as stated elsewhere [4], that the twin relationship creates the differences that emerge with the assumption of complementary roles.

Once established that differential psychology, by definition centered on the psychic differences between individuals in general, can use MZ twins to carry out appropriate research strategies, it becomes essential to make reference to a wideranging theory of psychological differentiation; this must not only be able to diachronically frame cognitive and personological individual differences but also to link differentiation, understood in an intrapsychic and interpersonal¹ sense, to the process of individuation.²

Psychological differentiation between environmental and biological determinism

Witkin’s theory of psychological differentiation [26] is primarily well-known as a theory able to explain global or analytical cognitive functioning of subjects who, depending on their perceptual style, that is, field dependence or field independence, are located at the extremes of a continuum. Witkin, on the basis of a large amount of empirical data, included the personality in its wholeness in this construct by focusing on controls and

¹ From the point of view of concept and terminology it is important to distinguish between intrapsychic and interpersonal differentiation. In the area of field dependence/independence cognitive style, intrapsychic differentiation means a developmental level of mental life concerning the cognitive and psychodynamic area. Instead, interpersonal differentiation is the object of study of differential psychology and should be understood as the way behavioral and psychic differences take shape between individuals, groups, sexes, age groups, social classes, cultures and ethnic groups [11].

² Individuation means the result of the integration of the notion of juridical person with that of personal identity. The social context begins to promote individuation by assigning a name to every newborn; and this corresponds to juridical individuation in a strict sense. Then, at different levels of development, the subject carries out an active role in his/her own individuation, characterized by self/hetero reference. In this view, the processes of socialization and development constitute two inseparable aspects of the same process [10] and individuation corresponds to the construction of a differentiated individuality (in MZ twins, starting from an identical nature to that of the partner).

defenses that can be more or less structured and more or less specialized. Finally, in his 1979 model, besides constructs regarding psychodynamic (self/non-self separation) and cognitive (separation of psychological functions) aspects, constructs appeared at the intermediate level regarding the neuropsychological functions correlating individual differences with hemispheric lateralization.

More precisely, on the basis of Levy's [19] and Teuber's proposals, Witkin upheld that marked lateralization intensifies the activity of the two hemispheres, each in its own specific competencies. Thus, field independent subjects would show their competence on the perceptual disembedding test or would evidence a clear separation between affects and ideas based on the activity of the right hemisphere, specialized in visual-spatial tasks and involved in expressive manifestations and affective control. Along these lines, it seems logical that in less differentiated subjects (field dependent), identified by their poor performance on the perceptual disembedding test, cerebral organization would not be very specialized, in the sense of less clear-cut hemispheric asymmetry than that characterizing field independent subjects [3].

With regard to field dependence, it must be pointed out that a series of experimental studies [1] indicate that this is a composite variable: there is a primary type of field dependence, infantile or regressive, and a secondary type, corresponding to a psychic situation which is even more evolved than that of field independence. The subjects found at the second level may be those who, having surpassed the differentiating principle of reality (according to Freudian terminology), have reached the integrated level, which puts them in a broader sociocultural network.

With regard to the factors determining field dependence/independence cognitive style, a study on 10-year old children [27], observed correlations between maternal educational practices and children's cognitive style. Practices to facilitate the autonomous activities of the child led toward field independence and encouragement to respect norms and group cohesion led toward field dependence. On the contrary, other studies using a genetic approach [24] have emphasized the importance of biological determinants of cognitive style, in terms of the anatomical-functional organization of cerebral structures, hemispheric asymmetries and hemispheric dominance in spatial tasks. Coherent with the theory of differentiation, the authors held that subjects with a different degree of psychological differentiation differ predictably in degree of hemispheric lateralization. From a review of studies conducted in this vein, the authors drew the conclusion that greater functional specialization of both hemispheres may indicate greater differentiation, in agreement with the respective predominant modality of processing. Thus, more field independent individuals tend to show more marked lateralization effects than more field dependent individuals in different perceptual modalities, mediated by one of the two hemispheres. The most relevant variations are linked to sex and manual dominance: females, compatible with a greater tendency toward field dependence, show less effects of lateralization; and males, who are more field independent, show more marked effects.

Field dependence in twin psychology

In the area of cognitive and personality differences in the twin pair, existing research on the relative weight of genetic and/or environmental factors is greatly reduced when the

emphasis is on field dependence/independence cognitive style. For the Russian researcher M.S. Egorova [7], although a broad base of data provides the reliability of diagnostic techniques and the relative ontogenetic stability of the indicators of field dependence/independence, the problem of the nature of cognitive style is still open. According to this author, data supporting the thesis that among the genetic-type factors influencing the indicators of field dependence/independence are those linked to the X chromosome – as suggested by the female tendency toward field dependence and lesser hemispheric lateralization – are quite controversial. For this reason “at least a partial determination of field dependence by socialization must be accepted as a fact”. The author, including the peculiarity of family educational style as independent variable, carried out a study on same-sex pairs, formed by MZ and DZ twins and single borns.

The high intra-pair similarity found in the MZs, compared with the pairs in the other two groups, seems to indicate the genetic component of variance. A subsequent control, carried out on characteristics of family socialization, showed a difference in relation to “family style”, but in the direction contrary to expectations: stricter educational practices were associated with less similarity between the MZs belonging to the same pair. However, the influence of educational style does not seem responsible for intra-pair similarity in MZs, a result which would give further evidence for the genetic influence on interpersonal variance in cognitive style. In the MZ group, the paradoxical pair effect is not present in the highly correlated tendency of EFT scores, but seems to have acted on the DZ group which, in the same survey [7], showed less field dependence and did not show significant indexes of intra-pair correlation.

In the context of Egorova's view, our study was carried out with variations on the classical twin method for contrasting groups as well.³ However, only two groups of twins were used as well as a group of only daughters (OD), randomly extracted and matched, and a group of sisters who were almost the same age (SASA), i.e., less than 24 months apart. This was to check the influence of the family environment on female field dependence. The major difference between the two studies was that all groups, made up of the same number of subjects, were formed by females, with the exception of the DZ group; this was made up in part by FF pairs and in part by MF pairs, in order to investigate the possible effect of a different educational style adopted by parents for male and female partners of the DZMF pair.

Since all subjects were raised and lived in their original families and also the subjects of the arbitrary OD pairs and the other three groups were of medium-high social level, our objective was to obtain the maximum concentration of genetic factors possible involved in field dependence in the MZFF group and the maximum concentration of environmental factors in the OD group (where the weight of hereditary factors was minimal since it corresponded to the genotypic heterogeneity of the Italian population). This

³The classical twin method defined by Galton, i.e., the “method for contrasting groups”, consists of comparing pairs of MZ twins in which genetic variability is by definition equal to zero. It was developed for studying groups of MZs and DZs, MZs raised together and MZs raised apart, same sex twins (MZ and DZ) and different sex twins (always Dz). The “twin control method” developed by a French psychologist [13], was meant to show the relationship between maturation and learning. The “twin pair method” was first introduced in 1948 [12] and then further developed in 1960 [30]; it primarily involves investigating the interaction between twins and the relationships which twins have with external society.

was carried out by controlling two important environmental factors, that is, family educational style and socio-economic level. This investigation on the genetic and/or environmental determination of field dependence was extended to several cognitive characteristics concerning conceptualization, because it was felt to be useful to introduce a term for comparison with field dependence at the level of the higher cognitive activities.

SUBJECTS

The research included 88 subjects (76 F and 12 M) or 44 pairs, divided on the basis of the following four groups of the same size:

MZ 11 FF (MZFF) pairs; DZ 11 pairs, 4 of which were FF and 6 MF (DZMF); SASA 11 pairs of sisters almost the same age (SASA); OD 11 pairs of only daughters formed randomly (OD).

Subjects were recruited from volunteer students in various faculties of the University of Rome "La Sapienza"; they were between 18 and 35 years of age; the between-group comparison carried out by means of ANOVA (1×4) was not significant. However, the four groups were basically homogeneous for age of subjects.⁴

Tests

Two frequently used tests were adopted to investigate the differences between the four groups (MZFF, DZMF, SASA and OD) as well as the intra-pair agreement-disagreement within each pair, regarding field dependence/independence cognitive style and several characteristics of conceptualization:

– Witkin's *Embedded Figures Test* (EFT) [20], which assesses cognitive style and degree of psychological differentiation. The test material consists of 12 cards the same size as playing cards. A geometric configuration of closed lines bordering small colored areas is reproduced on each card. Each configuration is a Complex Figure (CF) and constitutes a test item. On another 8 cards, marked with letters from A to H, is a Simple Figure (SF), made with continuous black lines. The SF is incorporated in the CF and is relatively difficult to discriminate. The subject's task is to find the SF inside the CF in the shortest time possible; this is what determines perceptual disembedding ability. Longer times needed for finding the hidden figure are considered to be the effect of the greater influence of the CF, that is, of the field; they are typical of more field dependent individuals. Vice versa, relatively short times are interpreted to indicate a greater capacity to perceive distinct parts of the CF analytically, typical of more field independent individuals.

⁴ Age range of subjects was the same as that indicated by researchers using the same approach [2, 6] as that in which most stabilization of neuronal circuits occurs. Neuronal selection, very intense in the first months of life with the development of synaptic connections, proceeds with the selection and stabilization of circuits until 16 or 17 years of age, and then becomes stabilized after 18-20 years of age.

The test provides three types of scores: mean time in seconds to find the hidden figure or *EFT mean*; overall number of errors made *EFT err.*; number of presentations of the SF required during the test, or *EFT sim*. Usually only the mean finding time is assumed as an index of field dependence or field independence, although the other scores can provide useful indications on the means and effectiveness of research strategies adopted for disembedding. For normative criteria on the present work, refer to a manual [20], which reports the following mean times [in seconds] of solution per item (and relative standard deviations) for Italian subjects between 18 and 29 years of age:

$$M x = 40.48 : sd = 29.83; \quad F x = 50.36 : sd = 25.69.$$

– The *Wisconsin Card Sorting Test* (WCST), originally developed to assess normal subjects' ability for abstraction and conceptual change, is now increasingly used as an instrument in the area of clinical neuropsychology. In this research we refer to a standardized method [15] and its computerized version [14]. The test material includes: a) 4 stimulus cards, placed from left to right representing a red triangle, two green stars, three yellow crosses and four blue circles. Each figure is always drawn the same way and all figures are placed on the card according to standard criteria; b) 128 response cards (two identical series of 64 cards each) similar to the preceding, numbered consecutively and put in order so that no two consecutive cards ever have the same color, shape or same number of elements. In the computerized version the cards are presented on a color screen in three horizontal bands. The four stimulus cards in the various color combinations (red, green, yellow, blue), shapes (triangle, star, cross, circle) and progressive number of elements (from 1 to 4) are lined up from left to right in the top band. The 128 response cards, separated by color, shape and number of elements, which- must be associated with one of the four target cards, appear one at a time in the bottom band. To make the association the subject presses the key on a number keyboard that corresponds with the position of the chosen card. Depending on the choice, the computer emits a high or low note to indicate respectively the positive or negative outcome of the choice. As the test progresses, the chosen cards move into the middle band on the screen, each under the corresponding target card. The computer trial stops automatically when all six stages C/F/N/C/F/N (six blocks of 10 consecutive exact responses, following the criterion of succession) have been completed, or when all of the 128 cards available have been selected, even when a lower number of stages (from 0 to 5) have been completed.

Twelve different scores result from the computerized administration:

CC – completed categories (from 0 to 6); NT – number of trials (cards presented); CORR – corrected responses; ERR – total wrong responses; PR – perseverative responses; PE – perseverative errors; NPE – non perseverative errors; % PE – % perseverative errors; TC1C – number of trials to complete first category; %CLR – % conceptual level responses; FMS – failure to maintain set; % LL – % Learning to Learn.

This test not only measures ability for abstract reasoning involved in the simple selection, but also ability to form, maintain and change the cognitive set and to learn using the feedback produced by the computer (or by the examiner) to change incorrect response strategies. However, the author points out that its test, differently from other abstraction tests, can provide objective measures not only of overall success, but also of particular sources of difficulty during the task, such as the initial inability to conceptual-

ize, or the inability (failure) to maintain the set and to learn through the various stages of the test. Further, the WCST is one of the few tests that has shown a specific sensitivity in cerebral lesions involving the frontal lobes. Recently, in a comparative work [21], a new interpretative hypothesis of the “perseverative responses” parameter was advanced from a psychological and not neurological viewpoint. This parameter may indicate the subject’s “mental rigidity” as well as possible cerebral damage. Thus, it would be possible to make predictions on the subject’s ability to learn new behaviors and to change his/her “personal constructs” [17].

DATA ANALYSIS AND DISCUSSION OF RESULTS

In the group of 11 DZ pairs, a preliminary comparison was made between EFT scores of the 6 FF pairs and the 5 MF pairs. Since this comparison was not statistically significant, it was possible to put the 11 DZ pairs together also justifying a posteriori the overall denomination of the group (DZMF).

In order to analyze the data, means and standard deviations of the EFT variable were first calculated separately for each group (Table 1). The ANOVA (1×4) on mean EFT scores in the four groups (MZFF, DZMF, SASA and OD) gives $F(3.86) = 4.25$, with $p = .007$.

Post-hoc comparisons reveal the differences between the MZFF and the other three groups. Therefore, with respect to the other groups, the MZFFs are shown to be more field dependent, since this is the only statistically significant difference.

Then intraclass correlations r_i were calculated – according to the following formula [8]:

$$r_i = \frac{F - 1}{F + (K - 1)}$$

As can be seen in Table 2, with regards to the EFT the highly significant intrapair correlations in the MZFF group ($p < .001$) indicate a correlated tendency of EFT scores between partners of MZFF pairs, which does not occur in the other groups. This result is congruent with many studies conducted on the cognitive efficiency of twins in which the intraclass correlations (or coefficients of similarity) were .85 – .90 for the MZ and .50-.60 for the DZ [18]. In the latter, the similarity found in the area of cognitive efficiency is more or less equivalent to that between male and female singletons or to that between parents and children (.49 and .52); it is much weaker between subjects who are unrelated and live together or between children and adoptive parents (.16 and .19) [26].

Table 1 - AGE and mean finding time score of EFT: means and sd of the four groups

	MZFF		DZMF		SASA		OD	
	x	sd	x	sd	x	sd	x	sd
AGE	23.80	5.10	22.80	2.90	22.20	2.72	21.40	3.14
EFT	59.80	32.60	43.50	23.90	34.50	14.70	39.30	2.90

Table 2 - Selected intrapair correlation coefficients (r_i) beyond significativity level (from the total r_i matrix)

	EFT	CC	Corr	Err	PR	PE	NPE	%PE	%CLC	%LL
MZFF	.81***	.76**	n.s.	n.s.	.65*	.68*	n.s.	.66*	.69*	n.s.
SASA	n.s.	.70**	.77**	.65*	n.s.	n.s.	.72*	n.s.	.65*	.62*

*** $p < .001$ ** $p < .01$ * $p < .05$

Due to the highly significant intrapair correlations which emerged only in the MZFF group, the hypothesis of the genetic determination of field dependence seems to be supported on two counts: by the greater field dependence of the MZFFs compared to the other groups and by the intrapair agreement found only in the MZFF group. However, to consider this determination linked univocally to the XX combination of chromosomes, the MZFF/MZMM comparison, which was not part of the experimental design of this work, is lacking. In this work we focussed only on FF pairs to establish the genetic and/or environmental determination of field dependence.

In this regard, the mean solution times on the EFT by the DZMF group seem to agree with the genetic determination of field dependence. This is because the subjects in the DZMF group, who by definition belong to twin pairs in which the mean weight of common heredity between partners is 50% (against the 100% in MZ), actually contribute to a lower EFT score than that of the MZFF group and higher than that of the SASA and OD groups.

However, the tendency of the mean solution times obtained on the EFT by the SASA and OD groups are not in the same direction and allow us to see the influence of environmental factors on field dependence which, in certain cases, could act by favoring or impeding the phenotypic manifestation of the genotype and in other cases could act apart from heredity. The MZFF group, characterized by the maximum concentration of genetic factors determining field dependence, is the most field dependent group and the only one which shows statistically significant intrapair agreement; however, the OD group, characterized by the maximum concentration of environmental factors and by no weight of hereditary factors with regard to field dependence, does not have the lowest mean score on the EFT. The SASA group is in the lowest position with mean weight of heredity by definition 25% and environmental weight equivalent to that of the MZFF and DZMF groups, since these subjects were raised by and live with their original families.

We do not believe that an “only daughter effect” can be excluded for the OD group; in medium-high social environments it could be linked to control mechanisms used by parents and families which have the effect of limiting psychological differentiation and, thus, the field independence of only daughters. From the viewpoint of moderate environmentalism, the intraclass correlations found in the MZFF group could also be read as due to the “couple effect”; several researchers in the area of twin psychology [5, 10, 31] have used this to explain the process of differentiation-individuation within a pair formed by biologically identical individuals. In the specific case of field dependence,

however, this effect does not diversify partners of a pair, but favors phenotypical manifestation of the genotype.

With regards to the WCST scales, the mean scores of the four groups are no different from the means indicated in the preliminary Italian version of the computerized test [21] and the between group comparisons carried out with ANOVA do not show significant differences. On the contrary, analysis of intraclass correlations carried out within each group show significant positive coefficients r_i in the MZFF and SASA groups (see Tab. 2), that is, in the two groups with respectively the highest and lowest field dependence scores on the EFT even when the differences emerging from post hoc comparisons between the MZFF group and the other three groups are considered indiscriminately. Probably the intraclass correlations which emerged only in the MZFF and SASA groups indicate that the greater or lesser ability demonstrable with the EFT to maintain elements separated in experience is not only congruent with respectively analytical and global cognitive styles, but can also be superimposed over other cognitive dimensions regarding the conceptualization, detectable with the WCST.

Even Witkin included Guilford's flexibility of adaptation and Dunker's functional fixity among these dimensions; the first corresponding with the ability to overcome a disembedding context and the second with the inability to do so. In this view it seems important to read the statistically significant intraclass correlations which emerged in the MZFF and SASA groups and which are totally absent in the DZMF and OD groups.

In the latter group, all correlations, even though not significant, are negative; however, this is a phenomenon we cannot attempt to interpret before analyzing the significant intraclass correlations.

In the MZFF group the *ricoefficients* regarding the following scales are significant and positive: CC (completed categories), PR (perseverative-type responses), PE (perseverative errors), %PE (% perseverative errors) and %CLC (% conceptual level responses). In the SASA group the intraclass correlations of the following scales are significant: CC (completed categories), CORR (correct responses), ERR (total wrong responses), NPE (non perseverative errors), %CLC (% conceptual level responses) and %LL (Learning to Learn).

Besides the WCST scales, whose scores are strictly linked to performance on this test (CC, %CLC, CORR, ERR), what marks the MZFF pairs is their perseverance in type of responses and errors (PR, PE, %PE); while the pairs in the SASA group are characterized by non perseverative errors (NPE) and by the ability to learn (%LL).

In previous unpublished work on MZ and DZ twins [9, 25], only in the MZs field dependence was correlated positively with several scales of the WCST (PR, PE, %PE) and negatively with LL (Learning to Learn). Even considering the limits of these works (small number of pairs, absence of extreme values of field dependence/independence), on the basis of what emerged in the present work in which only MZFFs were investigated and where control groups (SASA and OD) were introduced, it can be held that field dependence influences performance on the WCST because global strategies of performance of the task are adopted which favor the emergence of conceptualization errors and perseverance in these errors.

Finally, with regards to the OD group intraclass correlations on the WCST scales, which were non significant and all negative, the least risky interpretation seems to be the following: the "only daughter effect", which in the case of the mean group score on the

EFT acted as an environmental factor impeding field independence in only daughters, in the case of intraclass correlations on the WCST scales probably only reflects the artificiality of the formation of the OD pairs and not congruence of cognitive style with the conceptualization abilities investigated by the WCST.

CONCLUSIONS

This study, carried out on four groups (MZFF, DZMF, SASA, OD) of subjects selected for age, educational level, socio-economic level, living in original family and through the use of the EFT for field dependence and the WCST for conceptualization ability, allows us to make some final conclusions in terms of both differential psychology and twin psychology.

With regards to the first area, since field dependence cognitive functioning is a prerogative of the MZFF pairs, which are both female and have identical genetic patrimony, it seems to depend on genetic determination. What emerges from data analyses on the DZMF, SASA and OD groups makes the influence of environmental factors probable and, with regard to the OD group in particular, the influence of family educational style. The latter factor, together with the “couple effect”, typical of MZ twins, may not impede full phenotypical manifestation in MZFFs of a hypothetical field dependence genotype. Still in the area of differential psychology, it emerged that field dependence involves global performance strategies of the WCST which favor certain errors and perseverance in them.

With regards to the area of twin psychology, the “couple effect”, which leads to psychological differentiation between partners, does not seem to concern either field dependence or the characteristics of conceptualization shown by the WCST and linked to style of cognitive functioning.

We believe that the results in the DZMF group, which included 6 FF pairs and 5 MF pairs, are of great interest and should be more thoroughly investigated. In fact, in this group sex does not seem to influence the field dependence score, as we discovered by carrying out a preliminary comparison between FF and MF pairs. Further, this leads us to think that in the DZs, where by definition the pairs have 50% of their genetic patrimony in common regardless of how they are separated (MM, FF and MF), the influence of environmental factors is crucial for fully understanding the genesis of field dependence.

The field dependence of MZFFs and the intrapair correlations shown by the EFT and the WCST require that a MZFF/MZMM comparison be carried out with the same instruments used in the present study and possibly on a consistent number of pairs to determine whether or not and to what degree the certain hereditary component of field dependence should be attributed in twins and single borns to the XX chromosome combination.

REFERENCES

1. Ancona L (1970): *Dinamica della percezione*. Milano: Mondadori.
2. Changeaux JP (1983): *L'homme neuronal – L'uomo neuronale*. Milano: Feltrinelli.
3. Del Miglio C (1993): *Processi di dedifferenziazione nell'invecchiamento*. *Polarità* 2: 275-290.
4. Del Miglio C (1995): *Il sé gemellare*. Roma: Borla.
5. Del Miglio C, Posa MF (1995): *Indagine su alcuni aspetti significativi della relazione gemellare*. In C Del Miglio: *Il sé gemellare* 113- 127. Roma: Borla.
6. Edelman MG (1992): *Bright Air, Brilliant Fire – On the matter of mind*. Basic Books. New York. (Milano: Adelphi 1993).
7. Egorova MS (1987): *Genetic Factors in Interpersonal Variance of Field Dependence – Independence Indicators*. *Activ Nerv Sup* 1: 19-22.
8. Ercolani P (1979): *Metodi speciali di correlazione per la ricerca psicologica*. Roma: Bulzoni.
9. Falanga M (1994-95): *Le differenze interindividuali indagate con metodo gemellare*. Facoltà di Psicologia Roma "La Sapienza".
10. Fedeli L (1990): *Individuazione e identità*. Roma: Borla.
11. Galimberti U (1992): *Dizionario di Psicologia*. *Psicologia Differenziale*. Torino: UTET.
12. Gedda L (1948): *Psicologia della società intrageminale*. *Rivista di Psicologia* 4: 169-77.
13. Gesell A, Thomson H (1941): *Twins, T and C from infancy to adolescence: a biogenetic study of individual differences by method of co-twin control*. Mass.: Provincetown.
14. Harris ME (1990): *Wisconsin card sorting test: computer version*. Manual for Apple computers. Odessa USA.
15. Heaton RK (1981): *Wisconsin card sorting test manual*. USA: P.A.R.
16. Huteau M (1995): *Manuel de psychologie différentielle – La prospettiva differenziale in psicologia*. Roma: Borla.
17. Kelly GA (1955): *The psychology of personal constructs*. New York: Northon.
18. Larmat G (1979): *La génétique de l'intelligence*. Paris: Presse Universitarie Française.
19. Levy J (1974): *Psychobiological implications of bilateral asymmetry*. In Dimond SJ, Beaumont G (Eds) *Hemisphere function in the human brain*. New York: Halsteads Press.
20. Messina TM, Fogliani AM, Di Nuovo S (1984): *Dipendenza dal campo e stile cognitivo*. Firenze: OS.
21. Mucaria S, Paluzzi S, Paolillo V (1995): *Mente e intelligenza*. Wisconsin – computer version e matrici progressive di Raven – P.M. 47: due test cognitivi a confronto. In Del Miglio C, Paluzzi S. *Psicodiagnostica computerizzata*, 23-64. Roma: Borla.
22. Paluzzi S, Ferracuti S, Guariglia G, Paolillo V, Santoro MA (1991): *Moments préliminaires de validation et de standardization de la version computerisée du WCST-CV*. In Belardinelli Olivetti M *Scientific Contribution to General Psychology: Self Organizing Systems* 5: 37-38.
23. Pire G (1966): *Application des techniques sociométriques à l'étude des jumeaux*. *Enfance* 1: 23-48.
24. Pizzamiglio L, Zoccolotti P (1986): *Individual differences: cerebral structure and cognitive characteristics*. In Bertini M, Pizzamiglio L, Wapner S. *Field dependence in psychological theory, research and application*, 27-43. Hillsdale: Lawrence Erlbaum Associates.
25. Talli M (1994-95): *Le differenze interindividuali di stile cognitivo in gemelli e mononati*. Facoltà di Psicologia. Roma "La Sapienza".
26. Willerman L (1979): *The psychology of individual and group differences*. S. Francisco: Freeman.
27. Witkin HA, Dyk RB, Faterson HF, Goodenough DR, Karp SA (1962): *Psychological differentiation: studies of development – La differenziazione psicologica*. Roma: Bulzoni.

28. Witkin HA, Goodenough DR, Oltman PK (1979): Psychological differentiation: Current Status. *Journal of Personality and Social Psychology* 7:1127-1145.
29. Witkin HA, Oltman PK, Raskin E, Karp S (1971): *Manual for Embedded Figures Tests*. Palo Alto California: Consulting Psychologists Press.
30. Zazzo R (1960): *Les jumeaux, le couple et la personne*. Paris: Presse Universitaire Française.
31. Zazzo R (1984): *Le paradoxe des jumeaux – Il paradosso dei gemelli*. Firenze: La Nuova Italia.

Correspondence: C. Del Miglio, Dipartimento di Psicologia, Via dei Marsi 78 - 00185 Rome, Italy.