Developing a combined predictor measure for early detection of psychosis proneness

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Construcción de una medida predictora compuesta para la detección temprana del riesgo de psicosis

Summary

Introduction. *This study falls within research on neurocognitive risk markers of schizophrenia spectrum disorders, and its usefulness for early prevention strategies.*

Method. *Two samples of 60 adults and 65 children and adolescents, with some schizophrenia high-risk individuals among them, were studied with the aim of harmonizing different strategies for early detection. One of the most practical aspects of this study was the design of a combined and straightforward measure (different in adults and adolescents) of vulnerability to schizophrenia spectrum disorders (schizotaxia), in contrast to the high availability of neuropsychological measures. For that purpose, several psychometric analyses were made exploring schizotypy prodromes, as well as neurocognitive functions (prefrontal, attentional, working memory and general cognitive functioning tasks) or external markers of these disorders.*

Results. *In keeping with previous research, our results indicate that the more accurate measure of schizotaxia or vulnerability to schizophrenia combines, on the one hand, negative symptoms of schizotypy and, on the other hand, neuropsychological deficits in cognitive frontal functions such as memory, attention and executive functions.*

Conclusions. *Therefore, the findings suggest that it must be possible to identify normal subjects vulnerable to squizophrenia spectrum disorders, adults o adolescents, because some of them show early neurocognitive deficits and schizotipic symptoms similar to those observed in clinical samples.*

Key words: *Schizophrenia. Schizotypal personality disorder. Negative schizotypy. Squizotaxia. Neuropsychological deficit.*

Resumen

Introducción. *La presente investigación se enmarca en el estudio de las alteraciones neurocognitivas que son consideradas marcadores de riesgo para el desarrollo posterior de trastornos del espectro esquizofrénico, cuyo fin último es el planteamiento de posibles estrategias de prevención temprana.*

Método. *En un intento de compatibilizar los diferentes tipos de aproximaciones a la detección temprana, se han utilizado sendas muestras de 60 adultos y 65 niños y adolescentes, que incluyen ambas sujetos «de alto riesgo» para la esquizofrenia. Uno de los aspectos más prácticos que se derivan del presente trabajo ha sido el diseño de una única medida compuesta (distinta para adultos y adolescentes) que simplifique el proceso de determinar la vulnerabilidad de un sujeto a desarrollar los trastornos del espectro esquizofrénico (esquizotaxia) dada la elevada cantidad de medidas neurospicológicas existentes. Para este propósito se ha incluido en la medida construida la combinación de métodos psicométricos que exploran características esquizotípicas prodrómicas, así como la utilización de distintas tareas neuropsicológicas (prefrontales, atencionales, de memoria operativa y de funcionamiento cognitivo general) como marcadores externos de este tipo de trastornos.*

Resultados. *En la línea de trabajos anteriores, los resultados de nuestro estudio indican que una medida más precisa de esquizotaxia o vulnerabilidad a la esquizofrenia sería la combinación de la presencia de, por un lado, síntomas negativos de esquizotipia y, por otro, de déficit neuropsicológicos en funciones cognitivas frontales, de memoria, atención y funciones ejecutivas.*

Conclusiones. *Estos resultados apuntan, por tanto, la posibilidad de diferenciar sujetos normales en cuanto a la vulnerabilidad a los trastornos del espectro esquizofrénico, ya sean adultos o adolescentes, pues algunos de ellos presentan déficit cognitivos tempranos y síntomas esquizotípicos que afectan a las mismas esferas observadas en muestras clínicas.*

Palabras clave: *Esquizofrenia. Trastorno esquizotípico de la personalidad. Esquizotipia negativa. Esquizotaxia. Déficit neuropsicológico.*

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INTRODUCTION

Clinical evidence suggests that early intervention in schizophrenia is a critical factor to obtain better results

in its treatment[1,2]. Given this growing interest, three fundamental types of studies, whose objective is early detection of schizophrenia, were performed: 1) studies of first episode[3,4], whose objective is early identification of ill subjects immediately after the first psychotic episode; 2) studies of the prodromes, that is, the state that precedes the appearance of the disease in which certain clinical signs and symptoms or attenuated psychotic symptoms[5] can appear, and 3) studies of high risk of schizophrenia, initially based only on genetic risk, hence, its principal focus of attention is the study of first degree family members of schizophrenic patients[6,7].

Traditionally, investigators and clinicians have been formulating the hypothesis that schizophrenia can be predicted from certain characteristics of the personality[8], above all from schizotypy. The lastest tendencies center on the fact that the so-called «schizotaxia» or vulnerability to schizophrenia would be similar to «negative schizotypy», which could lead to the definition of «schizotaxia» as a syndrome[9].

Besides using data processing measures to identify the family members of schizophrenic patients who may show certain vulnerability to the disease, «high risk» psychometric studies that examine normal populations have been performed, trying to determine the risk of psychosis[10]. The investigation lines that have attempted to identify the potential risk markers of schizophrenia have included the use of neuropsychological measures, sensorial and perceptual processing measures, sustained attention measures, physiological indexes and psychophysiological measures of attentional abnormalities.

Neuropsychological tests are being applied with greater rigor and frequency in both psychopathological studies on schizophrenia as well as in the daily clinical practice, providing investigators with a better understanding of the relationship between cognitive deficit and other symptoms, and the possibility of identifying cognitive predictors of the disease[11]. However, because performance in one of these measures generally reflects multiple underlying sensorial and cognitive processes, it may be difficult to isolate the specific mechanisms responsible for the deficit performance. From this point of view, comparison of performance with simple neuropsychological measures may lead to erroneous conclusions on certain deficits. Thus, one of the ways to get around these problems inherent to neuropsychological measures is using combined neuropsychological measures, that is, groups of measures in agreement with a common predominant factor[12,13].

Relating this fact to the present study, multiple indicators of important risk have been analyzed, but none of these indicators alone have been shown to be a necessary or sufficient condition to define tendency or vulnerability to schizophrenia. Meehl's proposal[14] that the sum of the deviated scores in a combination of indicators may be the best measure of this tendency to schizophrenia constitutes the starting hypothesis here, considering that based on this measure, the statistical techniques of taxometric analysis may respond to the study of the nature of the latent vulnerability.

For this purpose, the combination of psychometric methods that examine prodromic schizotypal characteristics as well as the use of different neuropsychological tasks (executive, attentional, working memory and general cognitive functions) is proposed as external markers of this type of disorders. To do so, construction of possible combined or derived measures has been carried out in adult and adolescent population separately. This makes it possible to simplify the process resulting from the combination of schizotypy symptoms and of different neuropsychological deficits.

On the other hand, and in line with previous investigations[15,16], the present study is an attempt to make different types of approaches to early detection of schizophrenia compatible, trying to combine aspects of the prodromic studies and high risk. Its fundamental objective is to facilitate the establishment of early preventive intervention. Thus, in regards to the population being studied, two high risk samples are included: one sample of family members of schizophrenic patients (based on genetic risk) and another of adolescents in a youth halfway house (whose risk is based on their sociological characteristics and the existence of greater familial psychiatric morbidity, of a greater number of environmental stressors and fewer psychosocial competitions). In this way, and additionally, once the measure is made up, an attempt will be made to determine if the subjects initially considered «at risk» based on their genetic-familial vulnerability (in the adult sample) or social-environmental type factors (in the child-adolescent sample) mostly coincide with the risk detected by combined or derived neuropsychological measure.

METHOD

Participants

To study the objective proposed, two mixed samples of adult and adolescent population were chosen. Each one includes «at risk» subjects, according to their familial psychiatric or psycho-social type morbidity characteristics:

— *Adult population*. A total of 60 persons of the normal population were evaluated, 34 of whom were first degree family (siblings, children or parents) of patients diagnosed with schizophrenia seen in private medical offices or belonging to the Association of Family of Psychiatric Patients in Asturias (AFPPA). Of the subjects evaluated, 29 (85.3%) are siblings of patients. The normal adult population sample is completed with 26 family subjects of non-psychotic patients or persons with no link to the health care services (volunteers from the normal population). Of all the subjects, 23 are men (38.3%) and 37 are women (61.7%). Ages range from 18 to 59 years (mean: 29.7 years; SD: 9.8). No statistically significant differences were found between the two groups originating the sample in the

variables «age» (F: 0.38; p: 0.54) or «gender» (F: 1.17; p: 0.28).

— *Child-adolescent population*. Made up of 65 adolescents from the normal population, who are studying primary education, 27 of whom come from a youth halfway house and 38 from a public school. Ages ranged from 8 to 18 years (mean: 12.8 years; SD: 2.0). In regards to gender, 37 are men and 28 women (56.9 % and 43.1%, respectively). There were also no significant differences in this sample between the two original groups of the sample in regards to age (F: 0.11; p: 0.74) and gender (F: 0.47; p: 0.49).

Measures

Two different tests have been used based on the age of the sample as measures of psychometric schizotypy:

a) For the adult sample, the Oxford-Liverpool of Feelings and Experiences (O-LIFE) scale of Mason, Claridge and Jackson[17], according to the experimental version adapted by Lemos, was used. Its subscales are the following, according to the results obtained by its authors: Unusual experiences, Cognitive dis-organization, Introverted anhedonia and Impulsi-ve non-conformity.

b) In the adolescent population, the Multidimensional Schizotypal Traits Questionnaire for Young Adolescents (MSTQ)[18], in its experimental adaptation of Lemos, was applied. Our research team[19] has recently performed a new factorial analysis of the items that make up the scale, obtaining the following three subscales of schizotypy: 1) *positive schizotypy*, that refers to the characteristics of reality distortion, such as magic ideation, unusual perceptions and reference ideas; 2) *negative schizotypy*, related to patterns of social isolation, anhedonia and affective restriction, and 3) *impulsive non-conformity*, that refers to characteristics of impulsive type personality, social anxiety and maladaptive behaviors.

The following tasks have been chosen as external markers of schizotypy from among the many existing ones:

a) Two tests that examine *executive functions*, related to the forming of concepts, mental flexibility and planning, in the versions included in the STIM program software (supplied by Neuro Scan, Inc.):

— Stroop Test[20]: 100 stimuli, duration of each stimulus 100 msec., interval between stimuli of 1 sec.
— Wisconsin Card Sorting Test (WCST)[21,22].

b) Two specific memory tasks, one word recognition and another working memory:

— *Word Recognition Test* (WRT) developed by our research team. The errors made by the person when identifying words previously generated by him/her or by the computer are recorded.
— *Working Memory Visual Test* (WMVT) developed by Inda, Lopez and Paino, for this research framework. Series of screens with green or blue circles distributed differently are presented on the computer. The subject should remember after how many green circles appear on each one of the screens, successively.

c) A sustained attention task is also included, this task also being present among the STIM program tests mentioned above: Continuous Performance Test (CPT), traditionally used for the assessment of attentional processes[23]. The CONCPT version was used, with a presentation of 400 stimuli; the duration of each stimulus was 50 msec., with an interstimulus interval of 1 sec.

d) In addition, a series of verbal and visomotor tasks was applied, in which attention processes and working memory are also involved.

— In the adult population:

- Trail Making Test, parts A and B (TMT-A and TMT-B)[24,25].
- Digit coding subtest of the Wechsler Adult Intelligence Scale (WAIS)[26], that also involves the initiation of working memory and attention capacities.

— In the adolescent population:

- Trail Making Test, parts A and B (TMT-A and TMT-B).
- Verbal Fluency (VF) Task.
- Similarities subtests, vocabulary (verbal tests), digit coding and cubes (manipulative tests) of the Wechsler Intelligence Scale for Children (WISC). These subtests complete the general cognitive functioning and were applied according to the rules specified in the Spanish version manual[27].

RESULTS

In order to identify the subjects who are most vulnerable to develop a schizophrenic spectrum disorder, a combined, predictive, or derived measure that made it possible to simplify the process was constructed. Considering that the external markers of schizotypy selected for this study are sufficiently scaled and standardized, the scores of the subjects were initially included in the variables resulting from the different neuropsychological test. Only the *sensitivity* measures and *response criteria* of the CPT test were excluded, since these variables do not discriminate better or worse performance, but are only indicators of the subject's style when responding. For each variable, each subject was assigned a «1» when he/she was above a certain value, and «0» when below it.

As cutoff point to assign a «1» value, the percentile 80 (or 20, depending on the direction that deficit is expressed in each variable) was selected. The reason this value was selected as cutoff point that discriminates the «risk» subjects is based on recent investigations performed by this team[28], in which it was seen that the intergroup neuropsychological differences were more obvious when the comparison groups are narrowed, that is, when the performances of the subjects who are more markedly schizotypal (those who are above the 80 percentile) compared to those having less schizotypy (those below the 20 percentile) are compared. A relationship of the different resulting cutoff points can be seen in table 1.

In this way, the combined score for the adult sample came from the sum of the scores «1» and «0» in the 16 variables selected; thus, the interval of the scores obtained by the adults in this combined scale may range from 0 at a minimum to 16 at a maximum. In the case of the child-adolescent population sample, the score interval in this predictive measure may range from 0 at a minimum to 20 at a maximum (table 2).

Once the derived score was carried out, a first survey was performed to analyze the relationship of this derived or combined neuropsychological measure with the scores obtained by the subjects in the schizotypy factors measured for the adult and adolescent population with two questionnaires. Pearson's Correlation Coefficient was applied. Its results are shown in table 3. As can be observed, a significant correlation was only obtained in both samples with the negative schizotypy (measured with the Introverted Anhedonia factor of O-LIFE in adults, and the Negative Factor of MSTQ (Multidimensional Schizotypal Traits for Young Adolescents) in adolescents which, as we remind you, basically refers to aspects such as avoidance of social contact or emotional blunting. No significant correlation has been found between the derived score and the other schizotypy factors measured. This result coincides with those obtained in previous studies, performed with the child-adolescent population[28], in which it was verified that negative schizotypy is the only factor having a significant relationship with more cognitive deficits (table 3).

Finally, an analysis of contingencies was performed in order to find the optimum combined measure that correlates best with the schizotypal disorder, considering different cutoff points in the derived score and in the negative psychometric schizotypy measure to try to determine after what score in both variables would the most exact measure of vulnerability be obtained. Three levels were separately established for adults and adolescents as fixed cutoff points in the percentiles 80, 85 and 90, granting a value of «2» when the subject

TABLE 1. Percentile and cutoff values of the variables selected for the composition of the derived measure in the adult and adolescent sample

Variables selected	*Percentile used*	*Adults*		*Adolescents*	
		Cutoff value	*Number of subjects above percentile*	*Cutoff value*	*Number of subjects above percentile*
Common					
TMT-A	P80	49.4	12	65.0	14
TMT-B	P80	87.4	12	146.0	11
STROOP-Correct answers	P20	85.8	12	47.6	11
STROOP-Time outs	P80	16.8	12	29.2	11
STROOP-TR to congruent stimuli	P80	833.39	13	856.35	11
STROOP-TR to incongruent stimuli	P80	863.26	12	906.36	11
CPT-Mean of correct answers	P20	14.75	24	12.95	11
CPT-Mean of errors of commission	P80	0.50	20	7.8	11
CPT-Mean reaction times	P80	436.87	12	392.97	11
WCST-no of correct answers	P20	59.0	8	47.0	12
WCST-no of errors	P80	52.0	12	73.0	12
WCST-no if completed categories	P20	5.0	8	4.0	14
TRP-Errors in internal attribution	P80	8.0	13	13.2	11
TRP-Errors in external attribution	P80	7.0	13	10.0	16
PVMO-Total errors	P80	12.0	12	26.2	11
+Adults					
WAIS-Coding	P20	12.0	22		
+Adolescents					
WISC-Similarities	P20			7.2	11
WISC-Vocabulary	P20			3.2	11
WISC-Cubes	P20			7.0	14
WISC-Digit coding	P20			8.0	14
Verbal Fluency	P20			8.0	12

TABLA 2. Variables included in the combined or derived measure

Derived score: TMTA + TMTB + STROOP correct answers + STROOP time outs + STROOP response time to congruent stimuli + STROOP response time to incongruent stimuli + CPT measure of Correct answers + CPT mean of errors of commission + CPT mean of reaction times + WCST correct answers + WCST errors + WCST completed categories + WRT errors in internal attribution + WRT errors in external attribution + VWMT errors
+ (for adult sample): WAIS digit code
+ (for adolescent sample): WISC similarities + WISC vocabulary + WISC cubes + WISC digit code + verbal fluency

was located in the upper range and «1» in the lower range.

On the basis of combined or derived measure of the neurocognitive functions, four levels were also established as possible cutoff points (5, 6, 7 or 8) that indicate the number of deviations below or above the percentiles of 20 and 80 in the tests mentioned. Again, a value of «2» was assigned when the subject was located in the upper range and of 1 in the lower range.

Thus, an analysis of contingencies was performed with the measurements established with the cutoff points in negative schizotypy and in the derived scores, obtaining the results described in table 4.

The analyses of contingencies carried out help us to determine that, in the adult population sample, a more exact measure of vulnerability is that measure made up of extreme scores in the Introverted Anhedonia factor of schizotypy (above the 90th percentile) and deviations of 5 or more of the 16 neurocognitive measures. Thus, out of the 65 adults analyzed in the sample, 14 subjects who fulfilled this criterion were identified, subjects that could be considered hypothetically as at high risk of developing some disorder of the schizophrenic spectrum. Of these 14 subjects, 9 belong to the adult subgroup of «genetic risk» and 5 to the group we have called «normal».

TABLE 3. Pearson's correlation between schizotypy factors and the derived measure in adult and adolescent population

Adults		*Adolescents*	
Factors of the O-LIFE questionnaire on schizotypy	*Derived measure Percentile 20/80*	*Factors of MSTQ questionnaire of schizotypy*	*Derived measure Percentile 20/80*
O-LIFE: Unusual experiences	0.004 $p = 0.978$		
O-LIFE: Cognitive disorganization	0.206 $p = 0.120$	MSTQ: Positive factor	0.144 $p = 0.298$
O-LIFE: Introverted anhedonia	0.299 $P = 048$*	MSTQ: Negative factor	0.504 $p = 0.000$
O-LIFE: Impulsive non-conformity	–0.129 $p = 0.335$	MSTQ: Impulsive non-comformity	–0.117 $p = 0.400$

*≤ 0,05.

TABLE 4. Results obtained from the Contingency Analysis between dif fer ent levels of two variables: negative factor of schizotypy and derived score

	Percentiles in introverted Anhedonia (O-LIFE)	*Cutoff points in derived score*	*Contingency coefficient*	p
Adults	1-79/80+	0-7/8+	0.00	1.00
		0-6/7+	0.00	1.00
		0-5/6+	1.18	0.28
		0-4/5+	0.49	0.22
	1-84/85+	0-7/8+	0.00	1.00
		0-6/7+	0.00	1.00
		0-5/6+	1.18	0.28
		0-4/5+	0.49	0.22
	1-89/90+	0-7/8+	2.42	0.12
		0-6/7+	2.42	0.12
		0-5/6+	1.57	0.21
		0-4/5+	3.42	0.64*
	Percentiles in introverted schizotypy (MSTQ-N)	*Cutoff points in derived score*	*Contingency coefficient*	p
Adolescents	1-79/80+	0-7/8+	5.134	0.23*
		0-6/7+	5.134	0.23*
		0-5/6+	5.196	0.23*
		0-4/5+	3.243	0.72
	1-84/85+	0-7/8+	5.845	0.16*
		0-6/7+	5.845	0.16*
		0-5/6+	7.912	0.005**
		0-4/5+	5.750	0.16*
	1-89/90+	0-7/8+	2.101	0.147
		0-6/7+	2.101	0.147
		0-5/6+	2.427	0.119
		0-4/5+	1.601	0.206

*≤ 0,05; **≤ 0,01; ***≤ 0,001.

In regards to the child-adolescent population, we can affirm that the adolescents located above the 85th percentile in the negative schizotypy factor of the MSTQ and who also obtained a value of 6 or greater in the combined measure of neurocognitive deficit (that is, who obtained scores deviated by 6 or more of the 20 external markers) would also have, according to our work hypothesis, an increased risk of developing some type of schizophrenic spectrum disorder. A total of 14 adolescents of the sample fulfill this criterion, 11 of them belonging to the group initially called «at risk» (adolescents from the youth halfway house) who accounted for an even greater proportion than in the adult sample.

CONCLUSSIONS

The objectives of this study converge in the general proposal of identifying those persons with certain vul-

nerability to develop some schizophrenic spectrum disorder. A clear relationship has been found between schizotypal symptoms and cognitive dysfunctions in previous studies, performed with clinical populations. Thus, it is logical to pose the hypothesis that, based on samples of normal population, the mentioned relationship can also be obtained between schizotypy traits and cognitive deficits in at risk subjects.

At this point, therefore, it is appropriate to lay a foundation for the design and use of a combined derived measure of different cognitive measures. The present investigation provides support to a prefrontal explanation of the individuals differences in schizotypy in the normal population. The results indicate that the use of a neuropsychological approach to the non-psychotic personality disorders is valid, however, as established by Lencz et al.[29], *future investigations should use multiple measures of neuropsychological constructs to identify what subcomponents of neuropsychological functioning are especially affected*, which fully coincides with the object of this present investigation.

Thus, one of the most practical aspects arising from this study has been the design of a single measure that simplifies the process of determining vulnerability of a subject to develop schizophrenic spectrum disorders, given the high amount of neuropsychological measures available. It is considered that the development of this combined or derived measure is perfectly legitimate, since investigations on the neuropsychological deficits present in the risk subjects are sufficiently advanced to be able to select those tests, among all the possible ones, that best identify these subjects.

Another added advantage to identifying risk subjects by a combined measure is that it supports the idea that the schizophrenic disorders begin before the onset of the psychosis and they are expressed characteristically. The subjects with high scores in more than one behavior sign and/or risk psychometric marker are valid, from a theoretical point of view, to be chosen as samples that are rich for the study of the nature of the early processes of schizophrenia, for the development and validation of new vulnerability markers, and for preventive interventions that focus on vulnerability before it becomes an active disorder.

The procedures applied in this study show that it is possible to obtain a more precise measure of identification of those subjects who are more vulnerable to develop this type of disorders. It has been possible to find negative schizotypal symptoms and cognitive deficits using normal population samples, which clearly supports the ideal of a continuum between normal behavior and disease from the beginning. The initial premise for the development of a single predictive measure of schizophrenia risk and its spectrum coincides in its foundation with Tsuang and his team[30], who recently operationalized the research criteria for schizotaxia or tendency to psychosis on the base of a combination of negative symptoms and neuropsychological deficit, two areas that are fundamentally based on the robustness of the findings discovered in first degree family members of patients with schizophrenia. According to this study, a subject should present high or moderate levels of both negative symptoms as well as cognitive deficits to fulfill the criteria of schizotaxia.

Along the line of Tsuang, the results of our study indicate that a good measure to determine that a subject is at risk of schizophrenic spectrum disorders is the combination of the presence of, on the one hand, negative symptoms of schizotypy and, on the other, the presence of neuropsychological deficit in the following functions:

- *Executive frontal functions:* measured by Stroop tasks and WCST in our study.
- *Memory:* measured with the Word Recognition Test and Visual Working Memory Task.
- *Attention:* measured here with the continuous performance test.
- *Verbal and visomotor functions:* analyzed by the trail making test, as well as subtasks of WAIS or WISC and Verbal Fluency (according to the subject's age).

Thus, these results indicate that it is possible to differentiate normal subjects in regards to vulnerability to schizophrenic spectrum disorders, whether adults or adolescents, since some of them present early cognitive deficits and schizotypal symptoms that affect all the same spheres observed in clinical samples. Furthermore, the final result of our study indicated that a wide number of subjects belonging to the groups originally defined as «risk groups» adjusts to the requirements of the derived measure; this fact seems to indicate the existence of a clear relationship between the origin group and vulnerability to schizophrenia, relationship that seems to be even more conclusive in the adolescent population than in the adult population. Thus, it can be concluded that the existence of familial psychiatric morbidity and/or the sociological characteristics of the risk groups agree perfectly with vulnerability to develop schizophrenic spectrum disorders through a combination of negative schizotypy measures and cognitive measures.

In regards to the different populations used in our investigation, the fact that our study object was the normal population (differentiated by age) has special interest. Besides being a new strategy, it supposes a characteristic that probably gives more significance to our results, since it is surprising to have found significant differences. On the other hand, with this strategy, it has been aimed to bring the investigations performed with schizophrenic family members closer to those investigations centered on the psychometric identification of risk in normal population samples. However, a clear limitation when approaching the study has been the inaccessibility of our research team to the data regarding the psychiatric and familial background of the children from the youth halfway house. Thus, they could not obtain support in this study from the genetic background of the adolescents, which would certainly strengthen the definition of the adolescents of the youth group as group of initial risk.

In regards to the construction procedure of the derived measure, dichotomous variables (0, 1) based on a certain percentile value used as cutoff point were used. Although it is true that the choice of this cutoff point as a relevant critical level may leave out persons who are also at risk, we consider that the use of a wider range of scores in order to gather the information included in the quantitative results would be the object of another different study.

As a conclusion, identification, by neuropsychological techniques and measures of schizotypy (fundamentally negative) of the persons at risk of schizophrenic spectrum disorders represents a current investigation line, as it is an indispensable condition for the prevention of this type of disorders. The present investigation lines place the prodromic period as the best for the development of prevention strategies[1]. The abundant collection of vulnerability markers investigated can serve as a base for the determination of high risk studies designed to identify future cases, with sufficient sensitivity and specificity for preventive type interventions to be developed and validated. If specific neuropsychological deficits can be identified in persons at risk of schizophrenia, with or without genetic markers, it would be possible to use primary prevention methods aimed at decreasing the number of new cases of psychotic type disorders, counteracting the deficient cognitive capacities (perception processes and information processing) and providing these persons with social skills, before they can become a mental disorder. This is fundamental, if we consider that epidemiological studies show that schizophrenia is a highly incapacitating and relatively frequent disease, with a 1 % prevalence rate in the general population. Thus, many investigators are presently occupied with the recognition and early intervention of these persons[31], and some of their results are still waiting to be brought to light.

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