

Meta-analysis of family-based selective prevention programs for drug consumption in adolescence

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Abstract

Background: Substance consumption (SC) begins in adolescence and has been linked to protection factors such as family relationships (FR) and positive parenting (PP). There are few studies concerning the effectiveness of prevention programs based on the family, even though assessing interventions is one of the objectives of preventive science. The aim of this study was to analyze the evidence on family-based selective prevention programs in relation to drug consumption in adolescents. **Methodology:** A meta-analysis of 9 studies with 102 measures grouped in three dimensions, FR, PP and SC, ranging between 2001 and 2015, was conducted. **Results:** Effect sizes (ES) were found to be 0.82 for FR, 0.71 for PP, 0.77 for the combination of both and 0.21 for SC. The Q and I² indexes expressed high heterogeneity. **Conclusions:** Despite obtaining high ES consistent with previous studies, the great heterogeneity found did not allow us to draw clear conclusions regarding the primary studies. It is recommended that methodological improvements in assessment and reporting processes be carried out for future comparisons.

Keywords: Prevention, family relationships, positive parenting, substance consumption, adolescents, meta-analysis.

Resumen

Meta-análisis sobre programas de prevención selectiva del consumo de drogas en adolescentes basados en la familia. Antecedentes: el consumo de sustancias (CS) comienza en la adolescencia y se ha relacionado con factores de protección como las relaciones familiares (RF) o la parentalidad positiva (PP). Existen pocas evaluaciones acerca de la eficacia de los programas de prevención basados en la familia. Evaluar las intervenciones es uno de los objetivos que persigue la ciencia preventiva. El objetivo del estudio es analizar las evidencias sobre los programas de prevención selectiva basados en la familia en relación al consumo de drogas en adolescentes. **Metodología:** se ha llevado a cabo un meta-análisis de 9 estudios con 102 medidas agrupadas en tres dimensiones, RF, PP y CS, comprendidos entre el 2001 y el 2015. **Resultados:** los tamaños del efecto (TE) encontrados para RF fue de 0.82, para PP de 0.71, para la combinación de ambas 0.77, y para CS 0.21. Los índices Q e I² expresaron alta heterogeneidad. **Conclusiones:** a pesar de obtener TE altos congruentes con los estudios anteriores, la alta heterogeneidad no permite sacar conclusiones claras acerca de los estudios primarios. Se recomienda realizar mejoras metodológicas en los procesos de evaluación y lo reporten para las futuras comparaciones.

Palabras clave: prevención, relaciones familiares, parentalidad positiva, consumo de sustancias, adolescentes, meta-análisis.

Drug consumption and its associated risk behaviors are one of the most important health problems in adolescence. On an international level, according to the United Nations Office on Drugs and Crime (UNODC, 2016), in 2014 approximately 247 million people aged between 15 and 64 consumed drugs, 29 million of whom suffered from a disorder related to substance consumption (SC).

SC is a priority target of prevention policies at national and international level. Nowadays, there are institutions and organizations that analyze evidence regarding the effectiveness of preventive interventions (Gottfredson et al., 2015). The increasing efforts to assess the results of preventive practices are affording

prevention the status of scientific quality it deserves, given the social, political, economic and health implications it has.

In recent literature we find a meta-analysis (MA) on the effectiveness of family interventions in teenagers to prevent SC, the study by Vermeulen-Smit, Verdurmen, and Engels (2015). These authors only collected evidence on randomized prevention studies. As regards assessing the effectiveness of selective prevention studies, they found that it was not possible to carry it out because there was too much heterogeneity between the studies (population, follow-up periods, measures, instruments used, etc.), so they conducted a narrative review. They pointed out that most studies do not report significant effects on the prevention of SC; so it was not possible to draw conclusions from their evidence (Vermeulen-Smit et al., 2015). They stressed that the drawbacks of these programs are their great heterogeneity and lack of significant effects, and suggested that this is due to the fact that the effective elements in selective programs are different from the ones applied in a universal population. The variety and seriousness of the problems that arise in adolescence, especially with a vulnerable

population, would indicate that interventions ought to be carried out more intensively.

In terms of analyzing the program components separately, we found the MA by Van-Ryzin, Roseth, Fosco, Lee, and Chen (2016) on family-based prevention of consumption in youth. They hold that, in general, family-based programs had small or moderate effects (mean effect size, ESS of 0.31) in relation to adolescent consumption. However, when they analyzed specific components from each program, the ones with the best results were those that intervened in family relationships (FR) and future orientation, with an ES of 0.44 and 0.56, respectively.

Along these lines, research by Van-Ryzin, Fosco, and Dishion (2012) found that greater parental monitoring of under 13-year-olds was negatively related to SC (McCann, Higgins, Perra, McCartan, & McLaughlin, 2013). Other authors such as Cava, Murgui, and Musitu (2008) also observed that, at these ages, the quality of FR was a protective factor and a major predictor for preventing consumption. They concluded that the quality of FR is especially relevant at the time when the move from primary to secondary school takes place. Parental monitoring and supervision, as well as the quality of FR, would have an indirect effect on SC, reducing the likelihood of children having problematic friendships, and therefore keeping them outside circles where other adolescents consume. In fact, it seems that the quality of FR and monitoring influenced each other reciprocally (Van-Ryzin et al., 2012).

Another study that obtained similar results is the review by Foxcroft and Tsertsvadze (2011) on universal family-based prevention programs, specifically targeting alcohol abuse. They point directly towards family-focused interventions that work on developing a positive family environment and behaviors as being responsible for the rise in the likelihood of adolescents adopting attitudes of resistance to external influences. Likewise, it is understood that family-based programs, unlike school-based ones, exert an indirect effect on SC.

After this review, we asked ourselves the following question, what evidence is there in the literature regarding the effectiveness of family-based programs to improve FR, PP, and to reduce SC in an adolescent population (10-18 years old)? The meta-analytical methodology, through the grouping and integration of evidence from different research studies, enables us to answer the question by giving a general measure of the effectiveness of interventions (Botella & Meca, 2015). In the field of prevention, assessing the efficacy, efficiency, and effectiveness, as well as the social implications of such results and of the components is an essential aspect in order to justify practices (Gottfredson et al., 2015).

Hence, the main aim of this research study was to analyze knowledge about evidence regarding selective family-based prevention programs for adolescents through the meta-analytical methodology.

Method

Literature sampling

The scientific literature review process for the MA was carried out between the months of October 2015 and January 2016. Articles published in journals and doctoral theses regarding selective prevention programs targeting drug consumption and criminal behavior, which were family-based and aimed at adolescents between 10 and 18 years old, were taken into account. All the results were

collected independently of gender, ethnicity or other characteristics that the subjects in the primary studies might have. The search focused on studies between January 2001 and January 2016.

The electronic bibliographic databases in which the search was conducted were: PubMed, EBSCO, PsycINFO, Scopus, SCIC-ISOC, Cochrane Database of Systematic, ERIC, Sciencedirect, Web of Science, Project Cork, Recolecta and TDX.cat. And the key words used to draw up the search equations were: family, programs, interventions, evidence-based, prevention, problems, behavioral, drugs, adolescents, teenagers, adolescence, parents, empowerment, competence, relationship and training. Databases of evidence-based programs such as SAMHSA and Blueprints were also consulted.

For the studies to be included in the MA they had to be written in English or in Spanish, published between January 2001 and January 2016, aimed at adolescents between 10 and 18 years old, with a clear family component, whose theme was SC prevention/reduction programs, behavior problems, improvement in FR, and PP. Regarding methodological criteria, only randomized or quasi-experimental studies with pre and post-test measurements were accepted, and they also had to contain sufficient data to enable the ES to be calculated.

Instruments

The software programs used were the *metafor* pack from the statistical program *R* to calculate the ES for each Dependent Variable (DV), the joint ES for each dimension, and for the *Q* and *I²* indexes. The program Review Manager (RevMan) developed by the Cochrane Collaboration (2008) was also used to produce the forest plot graphs.

Procedure

Initially, a total of 10,229 studies were identified, 10,153 of which were ruled out because of their key words, title or the abstract. In the second phase, 78 studies were assessed, by searching the text for information to be able to decide on their inclusion or exclusion. Finally, 9 articles were selected that fulfilled all the inclusion criteria (see Figure 1).

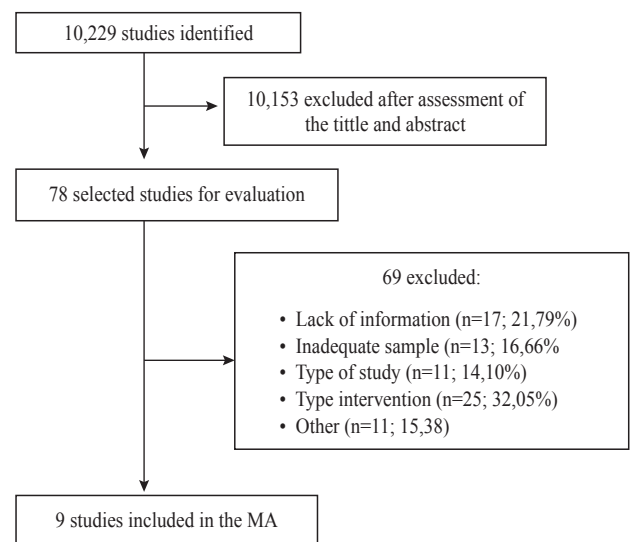


Figure 1. Study selection process

Studies that contained incomplete information in terms of methodology, or results which were confusing or deviated too far from the issue dealt with, were excluded. At methodological level, one study that used structural equations was excluded (Fosco, Frank, Stormshak, & Dishion, 2013), as it was the only one to use this statistical technique and as such was detrimental to the homogeneity of the methodology. Studies such as the ones by Bywater et al. (2011) and Hine and Moore (2015) were excluded because they had a very wide age range: from 2 to 17, and from 2 to 22, respectively. Studies with $N < 10$ and those that had a level less than 2+ were also excluded, in accordance with the Scottish Intercollegiate Guidelines Network, reviewed by Harbour and Millar (2001). Two reviewers selected the nine studies included

independently. The degree of agreement calculated using Cohen's Kappa coefficient was $k = .686$. A third reviewer resolved disagreements.

To calculate the ES of the studies that had more than one follow-up measure, the value nearest the end of the intervention was taken, in order to homogenize measures. Tables 1, 2 and 3, provide the mean, standard deviation of pre and post measures and ES (d). These values were obtained directly from the original studies, except for the ES, which was obtained from the standard deviation of the mean (SDM) between the pre y post measures, used as an efficacy measure.

Due to the large variety as far as types of DVs are concerned, we decided to group them according to whether they assessed

Table 1
Family Relationships dimension (35 DV)

Study	DV	n	M-Pre	SD-Pre	M-Post	SD-Post	d (SDM)	
Cervantes et al. (2011) Familia Adelante	1. Family attachment	153	4.19	1.04	4.28	1	0.09	
	2. Confidence to talk to parents	153	2.39	0.98	2.44	0.97	0.05	
Kumpfer et al. (2012)	3. Family cohesion	Irish	218	3.29	1.12	4.33	0.73	0.93
		SFP	1607	3.61	0.97	4.46	0.62	0.88
	4. Family communication	Irish	206	2.99	0.71	4.23	0.52	1.75
		SFP	1579	3.18	0.8	4.19	0.58	1.26
	5. Family conflict	Irish	206	3.1	1.15	2.41	0.89	0.60
		SFP	1544	2.4	1.10	1.96	0.86	0.40
	6. Family organization	Irish	214	2.27	0.91	3.8	0.85	1.68
		SFP	1597	2.7	0.94	3.97	0.72	1.35
	7. Family resilience	Irish	194	2.95	0.82	4.12	0.57	1.43
		SFP	1570	3.34	0.83	4.32	0.56	1.18
Moretti et al. (2012) Connect	8. Safe and secure base	31	1.77	0.72	2.37	0.83	0.83	
	9. Association and reciprocity	31	1.98	0.65	2.62	0.79	0.98	
	10. Positive feelings	31	2.08	0.56	2.79	0.85	1.27	
	11. Granting autonomy	31	1.62	0.53	2.11	0.59	0.92	
	12. Monitoring	31	2.21	0.68	2.58	0.69	0.54	
	13. Acceptance of parental authority	31	2.03	0.6	4.48	0.70	0.75	
	14. Appropriate/inadequate limits	31	2.32	0.65	2.58	0.84	0.47	
	15. Attention to physical needs	31	1.6	0.85	1.2	0.49	0.40	
	16. Nature of future relationship with the children	31	1.87	0.53	2.24	0.51	0.70	
	17. Intrusion	31	1.87	0.84	1.25	0.51	0.74	
	18. Parental identification /role reversal	31	1.69	0.76	1.16	0.43	0.70	
	19. Idealization	31	1.85	0.97	1.58	0.82	0.28	
	20. Power struggles	31	3.45	0.83	2.77	0.75	0.82	
	21. Pain/difficulty	31	3.31	0.91	2.66	1.01	0.71	
	22. Worry/fear	31	3.31	1.06	2.59	0.98	0.68	
	23. Anger	31	2.76	1.1	2.29	1.07	0.43	
24. Blame	31	2.54	1.2	1.98	0.81	0.47		
25. Indifference	31	1.31	0.49	1.24	0.54	0.14		
26. Recognition of achievements	31	1.43	0.74	1.33	0.62	-0.14		
Slesnick et al. (2009)	27. Family functioning: verbal aggression	EBFT	37	0.48	0.19	0.27	0.22	1.1
		FFT	40	0.51	0.25	0.26	0.2	1.04
	28. Family functioning: family violence	EBFT	37	0.08	0.09	0.04	0.07	0.44
		FFT	40	0.08	0.07	0.03	0.04	0.71
	29. Family cohesion	EBFT	37	4.23	2.25	5.5	1.79	0.56
		FFT	40	4.96	2.79	5.68	2.72	0.26
30. Family conflict	EBFT	37	5.05	2.32	4.23	2.22	0.35	
	FFT	40	5.88	2.37	4.44	2.53	0.61	
Kumpfer et al. (2010) SFP	31. Family cohesion	123	3.54	0.91	4.34	0.67	0.88	
	32. Family communication	124	3.11	0.69	4.14	0.66	1.49	
	33. Family conflict	123	2.85	1.05	2.3	0.8	0.52	
	34. Family organization	123	2.54	0.78	3.75	0.79	1.55	
	35. Family resilience	126	3.11	0.78	4.21	0.57	1.41	

the dimensions of FR (warmth, communication, cohesion, etc.), PP (supervision, parental efficacy, involvement, etc.), or SC (consumption of legal and illegal drugs). Finally, a joint ES was calculated for each of the aforementioned dimensions.

Data analyses

To analyze the ES, a random effects model was used, assuming that the studies included have differences between each other. The heterogeneity of the ES of the study was assessed through Cochran's *Q* and the *I*² index. The level of significance of the contrast statistic *Q* was $\alpha = 0.1$, with a confidence interval of 90% to make up for the problems of contrasting statistics with a low sample.

Results

After conducting a search of the literature, we found few studies where FR and PP were studied and where, besides, data were provided regarding the assessment of the aspects that had

been intervened. Some only analyzed certain aspects of FR, such as trust when speaking to parents (Cervantes et al., 2011), or parenting practices (Santisteban et al., 2011). However, other studies such as the ones by Kumpfer et al. (2012, 2010) and Moretti et al. (2012) did perform a more comprehensive assessment of the impact of the interventions on specific aspects of FR and PP.

Nine studies were analyzed, with twelve intervention programs, 102 measures and 77 different DVs. The DVs of each of the studies were chosen according to whether they measured FR (Table 1), PP (Table 2), or SC (Table 3). As can be observed, the heterogeneity found when assessing the dimensions makes a comparison difficult without assuming that we are using different measures, which justifies the use of a random effects model to perform the MA.

After calculating the ES for each dimension, the significant ESs were obtained, $d=0.82$ for the FR dimension; $d=0.71$ for the PP dimension; and $d=0.77$ for the combination of the measures from both dimensions. The *Q* statistic was significant ($p<.001$, 99% CI) for the FR dimension ($Q(df=43) = 92.17, p<.001$); the PP dimension ($Q(df=34) = 62.09, p= .002$); and for the combination of FR and PP ($Q(df=78) = 154.76, p<.001$). However, it was not significant

Table 2
Positive Parenting dimension (26 DV)

Study	DV	n	M-Pre	SD-Pre	M-Post	SD-Post	d (SDM)
Kumpfer et al. (2012)							
Irish	36. Parental involvement	182	3.28	0.97	4.28	0.68	1.03
SFP	36.	1587	3.51	0.94	4.33	0.64	0.87
Irish	37. Parental supervision	212	2.88	0.92	4.15	0.64	1.38
SFP	37.	1585	3.22	0.78	4.18	0.54	1.23
Irish	38. Parental efficacy	212	2.95	0.98	4.14	0.72	1.21
SFP	38.	1602	3.24	0.88	4.14	0.65	1.02
Irish	39. Positive parenting	216	3.52	0.95	4.53	0.57	0.92
SFP	39.	1602	3.79	0.90	4.62	0.51	1.06
Irish	40. Parental skills	176	3.11	0.84	3.91	0.70	0.95
SFP	40.	1580	3.40	0.74	3.95	0.64	0.74
Butler et al. (2011)							
MST	41. Positive parenting (parents)	53	38.7	4.8	40.2	5.7	0.31
	42. Positive parenting (children)	53	36.5	10.4	37.00	10.2	0.05
	43. Emotional connection (parents)	53	7.1	4.6	7.7	4.2	0.13
	44. Emotional connection (children)	53	1.9	6.6	4	5.9	0.32
	45. Autonomy (parents)	53	3.9	4.9	5.7	4.7	0.37
	46. Autonomy (children)	53	3.4	5.1	1.4	4.9	-0.39
Moretti et al. (2012)							
Connect	47. Parental competence	31	2.04	0.65	2.83	0.92	1.22
	48. Self-understanding	31	1.9	0.53	2.3	0.65	0.75
	49. Self-sacrifice	31	2.55	0.88	1.87	0.65	-0.77
	50. Confidence in the child's abilities	31	1.91	0.64	2.33	0.69	0.66
	51. Understanding of the child	31	2.04	0.75	2.46	0.74	0.56
	52. Elaborate perception of the child	31	2.24	0.58	2.64	0.67	0.69
	53. Perception of the child in the future	31	1.91	0.56	2.24	0.54	0.59
Santisteban et al. (2011)							
CIFFTA	54. Parenting practices teens' reports	12	6.08	2.09	7.45	1.54	-0.66
TFT	54.	13	6.26	1.52	5.89	1.89	0.24
CIFFTA	55. Parenting practices parents' reports	13	7.7	0.9	8	1.1	-0.33
TFT	55.	13	7.64	1.28	7.49	1.14	0.12
Slesnick et al. (2009)							
EBFT	56. Parental care	37	23.13	6.56	24.78	7.49	0.25
FFT	56.	40	20.3	10.37	24.29	0.9	0.39
EBFT	57. Parental overprotection	37	18.7	8.48	14.3	7.24	0.51
FFT	57.	40	18.14	9.68	15	7.52	0.32
Kumpfer et al. (2010)							
SFP	58. Parental involvement	123	3.42	0.86	4.25	0.72	0.97
	59. Parental supervision	128	2.97	0.73	3.69	0.63	0.99
	60. Parental efficacy	123	3.12	0.82	4.06	0.66	1.15
	61. Positive parenting	123	3.69	0.9	4.5	0.7	0.9

Table 3
Substance Consumption dimension (16 DV)

Study	DV	n	M-Pre	SD-Pre	M-Post	SD-Post	d (SDM)	
Cervantes et al. (2011) Familia Adelante	62. Alcohol consumption last 30 days	153	0.62	2.83	0.71	2.43	-0.03	
	63. Alcohol intoxication last 30 days	153	0.68	3.84	0.0	0.0	0.18	
	64. Marijuana use last 30 days	153	1.58	4.86	0.0	0.0	0.33	
	65. Other illegal drug use last 30 days	153	1.34	4.6	0.0	0.0	0.29	
Kumpfer et al. (2012)	Irish	188	1.77	0.7	1.6	0.55	0.24	
	SFP	1552	1.32	0.53	1.25	0.52	0.13	
Santisteban et al. (2011)	CIFFTA	67. Marijuana-cocaine use	12	5.15	4.93	5.85	9.16	0.93
	TFT	67.	13	11.08	11.31	.58	1	-0.14
	CIFFTA	68. Marijuana use	12	4.54	4.31	5.46	9.08	0.8
	TFT	68.	13	7.75	9.11	0.50	0.90	-0.21
	CIFFTA	69. Cocaine use	12	0.62	0.96	0.38	0.96	0.38
	TFT	69.	13	3.33	8.54	0.08	0.29	0.25
Slesnick et al. (2009)	EBFT	70. Average drink units	37	9.67	6.1	4.36	6.67	0.87
	FFT	70	40	9.84	5.22	4.68	5.1	0.99
	EBFT	71. Substance consumption diagnosis	37	1.91	1.2	1.13	1.22	0.65
	FFT	71.	40	2.08	1.09	1	1.33	0.99
	EBFT	72. Teen drinking index	37	26.68	10.83	24.32	11.29	0.22
	FFT	72.	40	27.6	14.13	20.16	14.78	0.53
Hogue et al. (2015)	UC-FT	73. Alcohol and other drug consumption	104	6.6	8.5	8.9	9.9	-0.27
Kumpfer et al. (2010)	SFP	74. Alcohol-drug use	122	1.42	0.7	1.19	0.36	0.33
Azrin et al. (2001)	FBT	75. Drug use (PHYS)	29	20.6	25.5	67.93	23.51	-1.88
	FBT	76. Drug use (YHPS)	29	12.17	23.92	63.91	41.2	-2.16
	FBT	77. Drug use (LSS-A)	29	64.93	31.34	65.57	37.76	-0.02

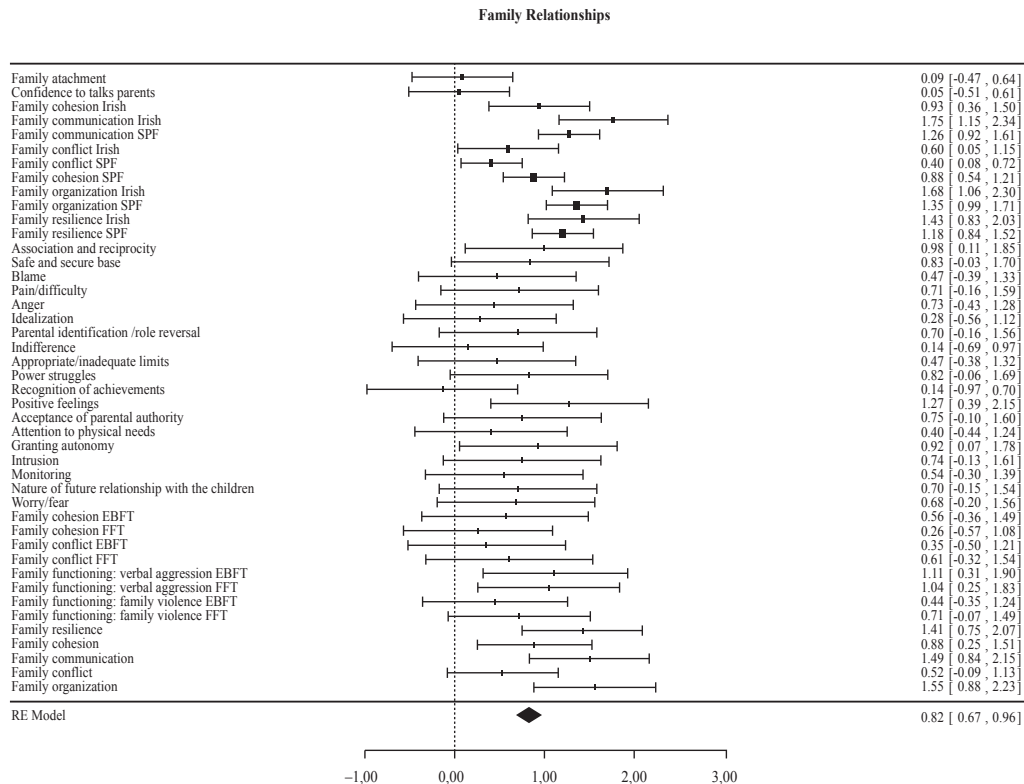


Figure 2. FR forest plot

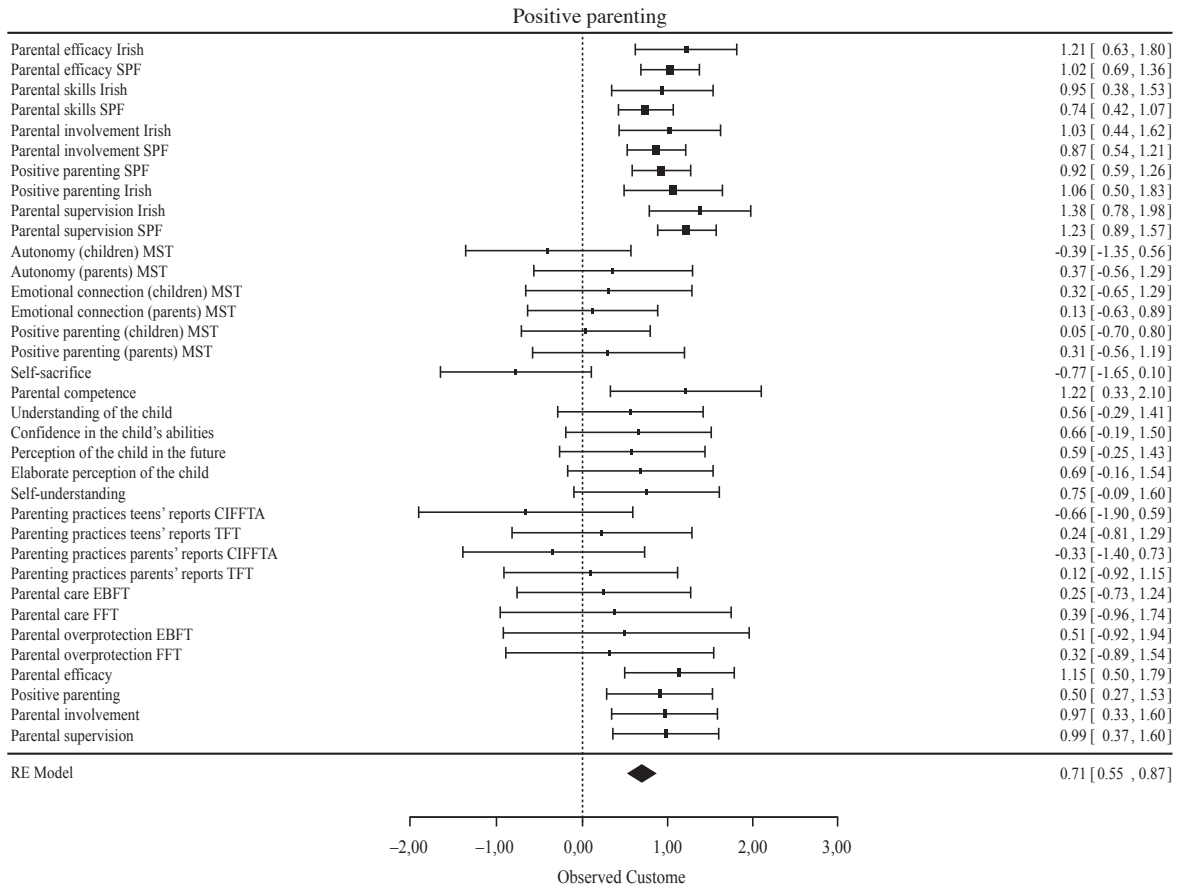


Figure 3. PP forest plot

for the PP dimension, or for the SC dimension ($Q(df=22) = 11.69, p=.963$).

As regards the I^2 index, both FR ($I^2=53.78%$), PP ($I^2=48.53%$), and the analysis of the combination of both ($I^2=51.69%$), showed moderate total heterogeneity percentages according to the interpretations of this index made by Higgins, Thompson, Deeks and Altman (2003). As expected, given that the Q index showed no heterogeneity, the I^2 index for SC was 0.00%.

Discussion

The aim of this study was to analyze the evidence regarding the effectiveness of interventions on family-based selective prevention for an adolescent population in relation to improvement in FR, PP, and SC. The results reveal high ES for FR, PP and the combination of both, and a low one for SC. Despite the fact that high ES were obtained, the heterogeneity tests tell us that it is difficult to draw clear conclusions because of the great variability as regards ES between the studies. This is due to the fact that there are programs such as the *Strengthening Families Program* (SFP) (Kumpfer et al., 2010, 2012), which obtain much higher ES in the dimensions, in comparison to the rest.

We found few programs that work with families and assess FR, an aspect that has been pointed out as a fundamental element for success in interventions with the family (Van-Ryzin et al., 2012, 2016; Foxcroft et al., 2011). It can be observed how the programs that showed the best results in the FR and PP dimensions, that

is higher ES, also have higher ES in SC; for instance, the SFP by Kumpfer et al. (2010, 2012). This suggests that programs that use strategies to improve FR and increase PP reduce SC in adolescents.

As has been confirmed in recent meta-analytical studies on the issue, family-based programs that have the work component of FR have been shown to have an important ES, $d=0.44$ in Van-Ryzin et al. (2016), and in our study this ES is even greater, $d=0.82$. These data support the results especially in mid-adolescence, which is considered a critical stage for the prevention of SC, when such important changes take place, for instance passing from primary to secondary school, identity development, and the biological changes associated to evolutionary development (Van-Ryzin et al., 2012; McCann et al., 2013; Cava et al., 2008).

Upon analyzing the results whilst taking into account the homogeneity tests, we found moderate variability, which makes it difficult to confirm that the studies are estimating the same effect. It is at this time when it would make sense to assess the possible influx of moderating variables, an analysis for which it would be necessary to have more information than is provided in the studies analyzed. This is one of the problems reported in the most up-to-date research: there is a lack of detailed systematic reports of the contents of the programs, of the population they are aimed at, of the scopes in which they are administered, and also of the instruments with which the DVs are measured (Foxcroft et al., 2011). It is necessary to perform more comprehensive assessments and methodological improvements in the application of certain

programs as, although the ES may be high or low, the studies that are analyzed today in most of the MA are very heterogeneous (Espada, González, Orgilés, Lloret, & Guillén-Riquelme, 2015).

High heterogeneity between studies is an important issue when it comes to analyzing the effectiveness of intervention programs (Vermeulen-Smit et al., 2015). The present results suggest that family-based interventions carried out in the future should provide adequate measures regarding FR, PP, and SC. The primary studies must explain their interventions in detail, carry out methodological improvements, and increase homogeneity in the designs (Vermeulen-Smit et al., 2015), in order to facilitate comparisons. For this purpose, it is essential to unify measures, specify the dependent variables associated to the constructs, and improve the assessment processes of the interventions. Managing to conduct assessments as to the effectiveness of prevention programs will enable us in the future to design and select interventions that will obtain better results in the field of prevention (Gottfredson et al., 2015).

Taking into account the limitations of this study and the

primary studies found in the literature, we are able to confirm that the programs analyzed produce changes in specific aspects of FR and PP. The high heterogeneity and low number of studies that fulfilled the inclusion criteria turned out to be an important limitation when it comes to assessing effectiveness, but they are both the same difficulties that have systematically been found by authors in the field of assessment (Van-Ryzin et al., 2016; Espada et al., 2015; Vermeulen-Smit et al., 2015; Foxcroft et al., 2011). We expect these limitations to be taken into account in future studies to be able to carry out assessments as to the effectiveness of preventive science.

Acknowledgements

This work is one of the results of the following Spanish Government Research Project (MINECO): EDU2013-42412-R “Cultural adaptation of the *Strengthening Families Program 12-16*. Proposal of evidence-based family prevention at risk.

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