Using personal network analysis to understand the interaction between programmes' facilitators and teachers in psychoeducational interventions

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A B S T R A C T

In this study we use personal network analysis to examine the social relationships taking place throughout programme implementation. Previous literature on psychosocial intervention has used network analysis techniques to examine: (a) the interaction between participants, (b) the facilitators' link to the intervention target group, (c) the transfer of knowledge between experts and facilitators, and (d) the interaction of facilitators with each other. However, there has been little research on how facilitators connect with other figures in their organisational context, impacting both intervention fidelity and the fit of the programme to the local context. In this study we combine the analysis of personal networks with qualitative interviews with 102 teachers in 72 schools in Barranquilla (Colombia), with whom we describe the implementation of the psychoeducational programmes Pisotón and Metodologías Flexibles. The results show that programme implementation networks not only rely on facilitators but also on the contribution of the schools' director of studies, the coupling with the regular classroom teachers, and occasional collaborations from the rest of the school staff. After conducting a cluster analysis, we detected the existence of two types of personal networks, some based on the functioning of highly cohesive teams and others with a greater level of centralisation around the head of studies. Implementation networks not only enable the implementation of programme activities, but also the integration of the programme into educational organisations. In the discussion we reflect on how the analysis of facilitators' personal networks can be used to improve the process of programme implementation.

1. Introduction

Psychoeducational programs are behavioural interventions that are intended to prevent or reduce the incidence of certain social problems. Their implementation at schools usually lies on facilitators or teachers, so that the systematic exploration of the relationships that occur during the implementation process can contribute to program evaluation. On the one hand, exchange networks between teachers are relevant in adapting programs to the diversity of educational contexts, contribute to the professional development of teachers and can have a positive impact on the climate and performance of schools (Maya Jariego et al., 2022; Patfield et al., 2021; Varga-Atkins et al., 2010). On the other hand, the relationships between facilitators accelerate the dissemination of best practices and improve the implementation of programs (Holgado et al., 2014). In turn, facilitators and teachers can also interact during the development of the interventions, influencing their effectiveness.

Therefore, relationships between different program stakeholders are essential in getting programs adopted, implemented, and sustained (Valente et al., 2015).

In this study we use the analysis of personal networks to understand the process of implementing psychoeducational programs in schools in Colombia. First, we review the different applications of network analysis in program implementation. Second, we characterize the role of teachers as facilitators. Third, with this previous context, we develop an exploratory study to determine which are the main stakeholders supporting teachers when they act as program facilitators.

1.1. Social network analysis for program implementation

Social network analysis consists of the application of graph theory to formally represent the structure of social interaction processes (Borgatti et al., 2009; Butts, 2009). More specifically, personal networks focus on

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the set of social relationships that surround an individual and capture the contexts of social interaction that are most relevant to that individual (McCarty et al., 2019). Network analysis can help to better understand, monitor, and improve psychosocial programme implementation processes (Valente et al., 2015). Both relational data and the techniques to analyse networks' structural properties can enable needs assessment, the implementation of behavioural change interventions as well as programme evaluation. This is grounded on the premise that social relations can help explain the adoption of evidence-based practices, the development of activities included into the programme and even the impact of interventions on the target system.

The chains of experts and educators transferring scientific knowledge to professional practice are among the most studied relationships (Glegg et al., 2019; Neal et al., 2015; Palinkas et al., 2011; Shearer et al., 2014). Specifically, the social networks between academic researchers and programme facilitators enable the tracing or tracking of evidence-based practices adoption, understood as a process of diffusion of innovation (Lane et al., 2019). Analysing the role of social interventions managers and other possible intermediaries (e. g., public officials, academic researchers, funders, or trainers) involved in the transfer process is also common practice. In the case of advice networks, it is also usual to find the emergence of informal leaders who help spread intervention best practices, especially when they are part of highly cohesive community coalitions.

Nevertheless, the relationships that best describe the implementation process are those that happen between programme participants or between facilitators. On the one hand, the relationship between the professionals involved in the implementation of the programme is key to the effective development of activities. Facilitators exchange advice and information, share educational materials and offer instrumental support during the implementation of a programme. Eventually, different co-ordination roles may emerge from the networks of facilitators, who are responsible for coordinating the intervention strategies, contribute to programme consistency and enable the adaptation to local needs (Maya Jariego & Holgado, 2021; Neal & Neal, 2019). A similar role can be played by those who hold a formal leadership position within organisations (Nooraie et al., 2017).

On the other hand, the relationship between participants may influence how they react to and are affected by the programme, modulating the effectiveness of the intervention. For example, in a childhood obesity prevention programme, the cohesion of the social support network among parents of children in the target population showed a positive association with the impact of the intervention (Gesell et al., 2013). Likewise, the existence of strong ties between the participants and those promoting the intervention operates as a catalyst for behavioural change (Gesell et al., 2013; Tenkasi & Chesmore, 2003). In both cases, the relationships established during the implementation process within the system where the implementation takes place help to understand, and modulate, the impact of the programme.

Despite the diverse range of professionals involved in the development of psychoeducational programmes, the structural analysis of implementations is quite often limited to the relationships between facilitators. While this makes it possible to provide a detailed description of the required coordination between those who are directly responsible for the delivery of programmes, examining the relationships that facilitators might establish within a wider organisational context can offer a more comprehensive and holistic representation of the professional resources at play during the implementation process. All these antecedents show the relevance of the patterns of interaction around the facilitators in the implementation of programs. More specifically, the degree of structural cohesion of the personal network could be associated with the quality of the implementation. Accordingly, in this study we analyse the collaboration personal networks established by facilitators during the implementation of two psychoeducational programmes in a school context. Consistent with the research that we have summarized in this section, a certain level of structural cohesion of teacher networks can be

expected to be positively associated with implementation fidelity.

1.2. Teachers as facilitators

Compulsory education schools provide an ideal means to reaching children from all kinds of backgrounds and social strata. Therefore, schools may enable the implementation of programmes designed to intervene preventively in a developmental period in which behavioural changes can be effectively introduced, with a positive lifelong impact (Coie et al., 1993). This means that many preventive programs rely on schools as an intervention context, in which teachers often act as facilitators in the implementation.

Among the advantages of involving teachers as facilitators in the implementation of programs is their first-hand knowledge of the local context in which the intervention takes place. Teachers know their schools from the inside, they have direct information about the characteristics of their students and the places where they live, including insights into their family backgrounds (Smit, 2005). However, the implementation of programs is usually added to the day-to-day teaching activities of teachers, along with other professional responsibilities, generating an overload that can hinder the implementation process (Maya Jariego et al., 2022). Hence the importance of having the necessary technical support available.

This places teachers in an intermediary position (Farley-Ripple & Grajeda, 2019; Malin, 2021). Sometimes they are selected by academic researchers who have designed a program for them to put into practice. Other times it is the teachers themselves who select the evidence-based practices they want to develop in the classroom. In both cases, they connect scientific research with teaching practice, acting as "knowledge brokers" (Malin & Brown, 2019). However, this role is clearly modulated by the organizational context in which it takes place. Both the school planning and the type of leadership of the school principal determine the degree of autonomy of the teaching staff in decision-making, though it is important to bear in mind that teachers and other staff in educational settings traditionally operate as loosely coupled networks (Shen et al., 2017; Weick, 1976), and with a certain degree of self-organization, from the bottom up.

When teachers act as facilitators in the implementation of programmes, they often occupy a central role. The facilitators interact with each other to coordinate the activities of the program, connecting also with other teachers in the school and coordinating with the rest of the educational staff. In other words, they have an articulating role that aligns the development of the program with teaching and the life of the centre.

At the collective level, these same facilitators can form communities of practice, forming networks of innovative and highly active teachers who contribute to the professional development of their peers (Evert & Stein, 2022; Holgado et al., 2014). This is enhanced in digital environments, so the ability to cultivate and navigate social networks strategically is a skill that is becoming increasingly important among teachers (Oddone, 2022).

1.3. This study: teacher networks in the fidelity of implementation

Fidelity is one of the most important aspects in the implementation of educational interventions (Ma et al., 2023). With this, reference is made to the precision and consistency in the development of the activities of a program, as well as to the selection and adaptations that the teaching staff makes when they put the previously designed plans into practice. Therefore, it covers both the preparation and adherence to the original program as well as the adaptation of the activities to the specific school context in which they are developed.

Fidelity may depend in part on the relationships between educational personnel responsible for implementing the programs. For example, in the educational context, there are teachers who act as "program champions" and involve others, while mutual reinforcement

dynamics occur in the application of activities. There are also training and technical assistance relationships, or communities of practice that are formed among professionals (Walker et al., 2022).

In the specific case of programs aimed at children, it has also been found that implementation depends not only on institutional factors but also on relational aspects, such as the degree of empathy that professionals have towards their co-workers (Quiroz-Saavedra et al., 2023). On the one hand, the political support of the local government as well as the availability of the necessary services are determinants of a good development of the program. On the other hand, attitudes of collaboration and support with colleagues who carry out activities at lower hierarchical levels facilitate both the relationship with users and the resolution of problems that arise during the implementation of the programs for children and their families. Therefore, the interaction networks could indirectly inform the interpersonal context in which the programs are implemented.

The aims of this study are to (a) describe the structure of the professional networks in which facilitators of psychoeducational programmes in schools are embedded, and (b) determine how these networks affect the implementation process itself. To do so, we combine personal network analysis with qualitative descriptions, from the perspective of the facilitators, of how programmes work, based on two of the interventions with the largest coverage in schools in Colombia. Adopting this descriptive and inductive approach, we intend to uncover the most relevant actors in the operative development of such programmes at educational institutions and the types of relational strategies that facilitators deploy when putting the plan into practice. In other words, we built the networks based on the perception of the teaching staff, without delimiting a priori which professionals are relevant in the implementation of programs.

This is an exploratory study in which the analysis of personal networks serves to identify all the stakeholders who play a part in the implementation process, including some that would otherwise go unnoticed. In this context, the research questions are aimed at:

1. Describe and compare the social interaction patterns around facilitators during the implementation of two psychosocial programs.
2. Examine the relationship between social interaction patterns around facilitators and implementation fidelity.

1.4. Context of the study: analysed programmes

The case study is based on two psychoeducational programmes implemented in some schools in the Caribbean region of Colombia. *Pisotón* [Stomp] is an early childhood socio-emotional competences training programme based on the development of games, educational activities and story-based techniques. It has been applied with children between 3 and 7 years of age, showing a positive impact on their psychoaffective development throughout the different interventions carried out over more than 20 years in Colombia, Mexico, Panama, Bolivia and Ecuador (Manrique-Palacio et al., 2018).

Metodologías Flexibles [Flexible Methodologies] is a compensatory education programme that aims to ensure access to the education system, retention and progression for children in vulnerable situations. The program is targeted at children who are behind academically or at risk of dropping out of school. It also receives unschooled children. It is implemented in both primary and secondary education, taking the form of modules that are adapted to ensure educational coverage for children in dispersed rural environments, in situations of forced displacement, migrant families or in situations of extreme poverty. The programme has proven to be effective in both preventing school dropouts and fostering re-entry into the education system (Ortiz-Calderón & Betancourt-Romero, 2020). This program is applied in two versions: *Brújula* (in basic Primary Education) and *Aceleración del Aprendizaje* (for children between 10 and 15 years old). They are respectively called "Compass" and "Learning Acceleration".

Although both interventions are implemented as programmes in their own right, *Pisotón* operates as a complementary school activity while *Metodologías Flexibles* is integrated into the formal education system. *Pisotón* is a programme designed and promoted by a research group at the Universidad del Norte, which trains primary and pre-school teachers to incorporate the programme's activities into their practice. Conversely, *Metodologías Flexibles* is an educational module delivered by its own staff, driven by the Ministry of Education of Colombia. These are teachers whose educational task is specifically to work with students who are academically behind or at risk of dropping out of school. Therefore, while *Pisotón* is more vulnerable to external changes, the organisational design of *Metodologías Flexibles* has greater stability and continuity over time. The comparison of both programs allows us to explore how two interventions that vary in the degree of organizational integration at schools, while taking place in the same socio-economic context and education system, work in practice.

The dimensions of both programs are very different. The *Metodologías Flexibles* program covers the entire Colombian educational system. In 2022 it had an enrolment of 677,972 students, distributed mainly between primary education (72.9%) and secondary education (22%) (DANE, 2023). The *Pisotón* program has been progressively extended in its implementation in the different regions of Colombia. In 2014, it achieved complete coverage of all departments of Colombia, after 17 years of application of the program. However, participation has been variable in the different editions of the program. In the years with the greatest coverage, there have been more than 11,000 participating children and 4300 educational agents have been involved.[1]

2. Method

2.1. Participants

There were 102 teachers responding to the survey, who at the time of the interview were applying the *Pisotón* programme (n = 37, 36.3%) or the *Metodologías Flexibles* programme (n = 65, 63.7%). All of them had experience in undertaking the role of program facilitators. The majority of the respondents were female (87.3%), with an average age of 43.75 years (SD = 9.46) and about 6 years of teaching experience. The teachers were working at 72 educational institutions in the city of Barranquilla, in the Departamento del Atlántico, Colombia. In each case, they were in charge of a class of approximately 30 students.

The city of Barranquilla, located in the north of Colombia, is characterized by being a place of habitual reception for internally displaced persons and Venezuelan immigrants. In addition, the programs studied are frequently applied in low-income neighbourhoods with disadvantaged populations, where a concentration of social problems is observed. Moreover, the teachers surveyed tend to have a high proportion of students with special needs in the classroom. According to the census of formal educational establishments, 151,603 students with disabilities, between 5 and 17 years old, are enrolled in the preschool, primary and secondary levels. This represents two thirds of the total number of minors with disabilities in Colombia (Fundación Saldarriaga Concha y Laboratorio de Economía de la Educación de la Pontificia Universidad Javeriana, 2023).

2.2. Instruments

Relationships map. A diagram with three concentric circles was used to describe the implementation network (Kahn & Antonucci, 1980), after asking participants to represent "the name or pseudonym of the 15 people with whom you have the most regular relationship in your work context" (hereinafter "alters"). This procedure has shown good test–retest reliability with different populations throughout the life cycle (Levitt

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[1] Source: https://pisoton.uninorte.edu.co/pisoton/

et al., 1993; Morgan et al., 1997). In addition, they were requested (a) to distribute the alters more or less close to the respondent (hereinafter "Ego") depending on their relative personal importance and (b) to use a tie to represent those cases where a pair of alters were connected to each other by relationship of friendship. The participant was then asked (c) to indicate the professional role of each *alter* in the implementation of the programme and (d) to explain why each of them was important to the development of the intervention. That information was used to generate indicators on the number of relationships; the number of alters in each concentric circle; and the composition of each personal network according to the professional roles adopted by its members. The people represented in the segments closest to Ego are those whom the respondent perceives as most important. In this case, they were located in three segments, from inside to outside, from greatest to least relative importance, according to the perception of the respondent.

Implementation fidelity. To assess the fidelity, each respondent was asked to indicate whether the programme was implemented according to the intended design, with the expected frequency, with the necessary materials, using the reference manual and with the required training. These five self-constructed items were scored on a Likert-type scale between 1 ("strongly disagree") and 5 ("strongly agree"). These items were used to construct an integrated indicator for further analysis.

Qualitative interviews. Complementarily, qualitative information was collected through semi-structured interviews in which the facilitators and teachers were asked to describe the operation of the program during the last course. Specifically, they identified the resources and barriers to developing the activities planned in the program, providing details about the organizational context in which they were carried out. They were also asked to assess the quality and quantity of the activities implemented, reflecting on the key factors that influenced this process.

2.3. Procedure

To describe the characteristics of the personal networks, we rely on frequencies analysis, mean comparisons and qualitative examination of the comments made by respondents when listing their contacts and the relationships between each other. Secondly, a cluster analysis – following the *Quick Cluster* procedure – was performed to classify the personal networks, using as criterion variables both the network density and the number of contacts mentioned in the outer circle of the diagram (Blashfield & Aldenderfer, 1988). Quick Cluster analysis is a non-hierarchical classification procedure through an iterative process of assigning each respondent to a number of pre-established categories based on two or more criteria variables. Analyses were performed using SPSS Statistics for Windows, Version 26.0.

The density of a social network is the number of existing relationships out of the total number of possible relationships.[2] Given that in our study a fixed number of alters (n = 15) were collected from each respondent, the number of relationships indirectly informs about the density of the personal network. However, 8 respondents (7.8%) did not complete the total of 15 contacts required, so for some calculations we used the ratio between the number of relationships and the number of alters mentioned. In the study of the structure of personal networks, density appears systematically as one of the key dimensions in the description of individual differences (McCarty et al., 2019).

In a second phase, we counted the number of alters with three or more relationships in the personal network. That information helped us to describe the characteristics of the key actors, from a relational point of view, in the implementation of the programme. Next, as an element of validation, we carried out a qualitative examination of the roles played

by the different key actors mentioned by each interviewee.

In-depth qualitative interviews were conducted with all participants. The recordings of 70 interviews were transcribed and subjected to content analysis.[3] The qualitative information generated was examined by 6 independent observers, who later participated in a consensus-evaluation process in a focus group. One of the researchers wrote an integrated report that was iteratively reviewed and discussed by the observers until agreement on the interpretation was reached. Observers were graduate and postgraduate students in Psychology. This consensus approach is especially efficient when there is a large amount of information, as was the case in our study. Indeed, the exposure time of each interviewee ranged between two and three hours (including the application of the questionnaire and the qualitative interview). In the qualitative section, the recommendations were followed to promote the validity of the research, consisting of empathy with the population under study, the concretion of the empirical evidence provided, the search for heterogeneity, the inductive follow-up of the information obtained and awareness about the relationship between the researcher and the researched (Small & Calarco, 2022).

The visualizations of the networks were made during the interview, following the "participant-aided network diagram" procedure (Hogan et al., 2007). With the help of a model of concentric circles on the computer screen, the interviewer represents a network following the interviewee's instructions. This strategy generates information equivalent to traditional name generators and is especially efficient in field surveys, where there are usually more difficulties in conducting computer-assisted interviews or using specific software for network visualization.

The research involved the triangulation of information collected with a questionnaire, semi-structured interviews, and the hierarchical mapping technique for the preparation of sociograms. The questionnaire and qualitative interviews were used to evaluate program implementation, combining qualitative and quantitative data. The relationship map served to identify the personal contacts that the facilitators activated during the implementation of the program.

3. Results

3.1. Description of the structure and composition of the personal network

The data show the existence of not very cohesive professional networks, even though participants mentioned a comparatively higher number of strong ties, located in the concentric circle closest to *Ego*. In particular, respondents traced in their personal network about 13 out of 105 possible relationships, which means a density of 0.12. On average, they placed 7 people in the inner circle, 5 in the middle circle and 3 in the outer circle. As shown in Table 1, the most frequent type of professional contacts were established with regular classroom teachers (91.17%) and heads of studies (89.21%). In addition to the colleagues who implement the programme, other figures such as the psychologist, the teaching assistant or the school principal were also mentioned.

Cleaning staff, school canteen staff or school security staff are also sometimes called upon to provide operational support for the implementation of the programme. Kitchen staff play a key role in preventing school dropout, as many families send their children to school for the canteen service (or the food provided by the School Feeding

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[3] The interviews were conducted during the lockdown of the COVID-19 pandemic and were videotaped. Due to technical issues, not all of them were recorded in conditions susceptible to further analysis.

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[2] In this case the maximum number of possible relationships is (15 ×14) / 2 = 105. The density reports the degree of structural cohesion of the network which, as we have indicated in the literature review, could be associated with the quality of the implementation process.

Table 1
Descriptive data of the concentric circles of the personal network.

	N (%)	Min.	Max.	M (SD)
Cohesion				
Number of relationships	102 (100)	0	40	12.25 (6.4)
Relationships / *alteri* ratio	102 (100)	0	2.67	0.8474 (0.4)
Structure				
Inner circle	102 (100)	2	15	6.66 (2.6)
Middle circle	100 (98)	0	9	4.86 (1.7)
Outer circle	80 (78.43)	0	8	3 (2.1)
Comparison				
Regular classroom teachers	93 (91.17)	1	12	5.58 (3)
Pisotón teachers	22 (21.56)	1	9	3.64 (2.2)
Aceleración teachers	48 (47.05)	1	13	2.67 (1.9)
Brújula teachers	48 (47.05)	1	5	2.44 (1.3)
School Principals	61 (59.8)	1	3	1.05 (0.2)
Heads of Studies	91 (89.21)	1	4	1.31 (0.6)
Pedagogical assistants	43 (42.15)	1	5	2.12 (0.8)
Psychologists	48 (47.5)	1	1	1 (0)
Cleaning staff	49 (48.03)	1	3	1.39 (0.6)
Kitchen staff	25 (24.5)	1	3	1.76 (0.5)
Security staff	31 (30.39)	1	3	1.19 (0.4)
Other	68 (66.66)	1	14	2.07 (1.9)

Note. Both the structure indicators and the composition indicators show the percentage of respondents who have representatives of that profile or category in their personal network. That is why the sum is greater than 100 per cent.

Programme).[4] On the other hand, as the schools are located in vulnerable environments, security personnel prevent the sale of drugs in the vicinity of the school and ensure that the conditions for viable educational activity are preserved.

In comparative terms, it can be observed that *Pisotón* teachers, coinciding with the structure of the programme, make greater use of teaching assistants (t = 3.111, p < .003). They also rely more heavily on cleaning staff (t = 2.429, p < .019), possibly because they work with younger children who require help to go to the toilet. On the other hand, in the *Metodologías Flexibles* programme, the heads of studies are more important (t = −2.966, p < .004).

3.2. Two types of personal networks

The personal networks were classified using as criterion variables (a) the ratio between the number of relationships and the number of alters (which, as we have already pointed out, indirectly informs about density); and (b) the number of contacts located in the outer concentric circle, that is, those with a lower relative importance for the respondent. The results of the cluster analysis are summarised in Table 2.

Cluster 1 consist of teachers who have less cohesive networks and more personal contacts in the external segment of the personal network. They account for a total of 44.11 per cent of the sample. In contrast,

Table 2
Final cluster centres by density and number of weak ties.

Criterion Variables	Cluster 1 (*n* = 45)	Cluster 2 (*n* = 57)
Relationships / *alteri* ratio	0.82	0.87
People in the outer circle of the network	5	1

Note. Classification into two clusters performed through the Quick Cluster procedure for two categories, with a convergence criterion of 0.02 and updated means. Convergence was achieved with two iterations.

more than half of the respondents (55.88%) are characterised by comparatively denser networks, with a relatively low weight of weak ties.

According to the adjusted standardized residuals from the Chi-Square test, *Pisotón* teachers are represented above the expected frequency in cluster 1, while approximately two out of three *Metodologías Flexibles* teachers are included in cluster 2. Furthermore, in the first cluster, teachers rely more heavily on cleaning staff (t = 2.101, p < .041) and security staff (t = 2.171, p < .038). In contrast, teachers in the second cluster have on average 2.89 more personal contacts in the inner circle of the personal network (t = −6.460, p < .0001).

In sum, we find two types of personal networks that vary significantly in the degree of structural cohesion. We have illustrated this with two concrete examples in Fig. 1. The network on the left corresponds to a teacher who implements the *Pisotón* programme. Her personal network consists mostly of other pre-school teachers, some involved in the implementation of the programme and some not. Specifically, her peers make up 40 per cent of the alters. Teaching assistants also play an important role, accounting for 26 per cent of the total. The head of studies plays the key role in articulating the network, and is connected to two female teachers, the school principal and an assistant. Finally, on the periphery, cleaning staff and security staff are represented, among others.

The network on the right corresponds to a teacher implementing the *Metodologías Flexibles* programme. Her personal network is clearly denser than the previous case, and is concentrated in the two segments closest to *Ego*. As a whole it is a cohesive network of teachers, accounting for 60% of the total, with the additional participation of up to 4 heads of studies. *Metodologías Flexibles* teachers are characterised by the fact that they teach all subjects to students with problems to access or stay in education, or in general with special educational needs. They therefore need to be connected with regular classroom teachers, from whom they seek specialist advice on Mathematics, Language and other specific subjects.

A comparison between both cases reveals two distinct patterns of programme implementation. On the one hand, highly centralised networks around academic coordination figures, with specialist participation of pedagogical advisors and school staff who provide instrumental support (Fig. 1, left), that is, tangible and specialized help. On the other hand, denser networks, based on highly cohesive teams, with whom a more intense personal and professional relationship is established (Fig. 1, right).

Likewise, there are significant differences with regard to the perceived programme implementation fidelity between the two groups (t = −2.051, p < .043). In particular, the most cohesive networks correspond to teachers with higher scores on items indicating that the activities were carried out as planned and that the programme manual was closely followed during implementation.

3.3. Key actors in programme implementation networks

In order to identify the key actors in the implementation process, in Table 3 we summarise the count of those alters with 3 or more relationships in the personal network.[5] We also indicate their position in the personal network structure and the professional role they have. As the data show, in each network there are around 3 key actors on average. More than half of them occupy the network segment closest to *Ego* (58.3 per cent). Among the different roles analysed, regular classroom teachers and heads of studies are those who most frequently play that high connectivity role.

In the distribution of key actors, two different profiles can be

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[4] Sometimes the provision of the service falls under the informal organisation of school employees. For example, Venezuelan immigrant students are often undocumented and therefore do not have formal access to school canteen programmes or services. Teachers and other staff members at schools often organise themselves to meet this need by contributing their own resources.

[5] According to the descriptive data in Table 1, this implies locating actors involved in at least 25% of the existing relationships in the network, on average.
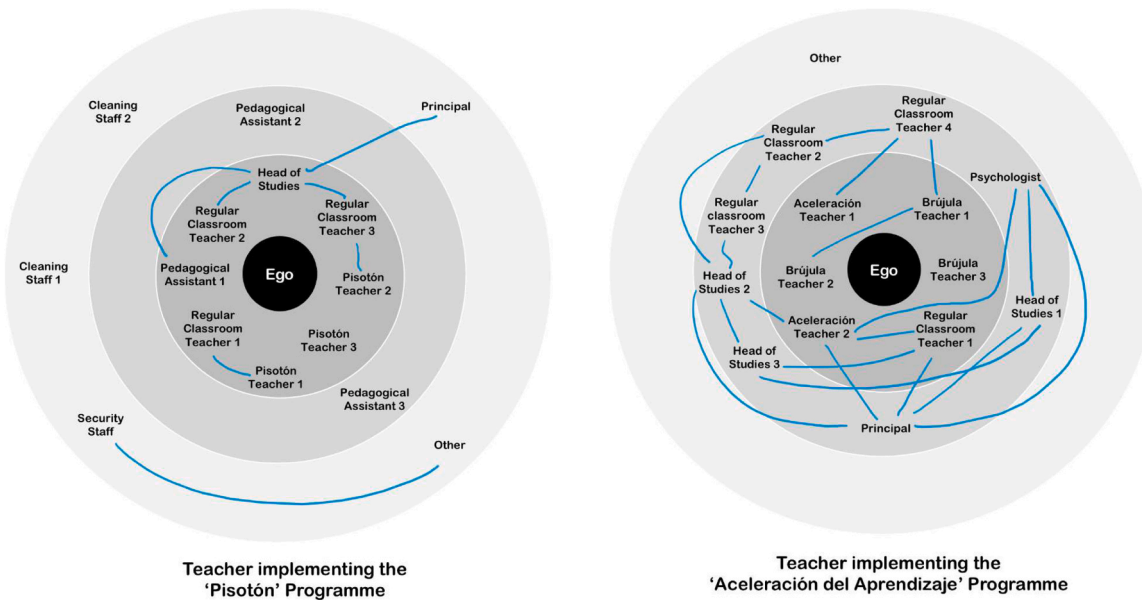
Fig. 1. Two illustrative cases of the clusters of personal network. The graph on the left represents the network of a teacher from the *Pisotón* program that belongs to Cluster 1. The graph on the right represents the network of a teacher from the *Flexible Methodologies* program that belongs to Cluster 2. In both cases, the segments closest to Ego represent a greater relative importance of the people mentioned by the respondent. The concentric circles represent the degree of closeness of members of the social support network, according to the perception of the informant.

Table 3
Key actors in programme implementation networks.

	N (%)	Min.	Max.	M (SD)
Key actors				
Number of *alteri* with more than 3 relationships	102 (100)	0	15	3.21 (3.6)
Structure				
Inner circle	102 (100)	0	8	1.86 (1.8)
Middle circle	102 (100)	0	7	0.97 (1.5)
Outer circle	102 (100)	0	5	0.36 (0.9)
Composition				
Regular classroom teachers	102 (100)	0	9	1.10 (2.1)
Pisotón teachers	102 (100)	0	2	0.16 (0.4)
Aceleración teachers	102 (100)	0	3	0.21 (0.5)
Brújula teachers	102 (100)	0	4	0.32 (0.8)
School Principals	102 (100)	0	1	0.15 (3.1)
Heads of studies	102 (100)	0	3	0.55 (0.6)
Pedagogical assistants	102 (100)	0	4	0.14 (0.4)
Psychologists	102 (100)	0	1	0.11 (0.3)
Cleaning staff	102 (100)	0	2	0.07 (0.2)
Kitchen staff	102 (100)	0	2	0.08 (0.3)
Security staff	102 (100)	0	2	0.06 (0.2)
Other	102 (100)	0	4	0.27 (0.6)

observed. Most of them have around 2 key actors, usually in the inner circle (n = 81, 79.41%), while about one fifth of the interviewees have up to 9 key actors, distributed more or less in the three concentric circles (n = 21, 20.58%). This second group has personal networks that are up to twice as dense as the rest (according to the relationship ratio indicator, mentioned above).

The three most prominent professional figures in the implementation networks are the heads of studies, the regular classroom teachers and their peers, with whom they share the implementation of the programme. This is indicated by the qualitative descriptions by respondents.

Heads of studies are in regular contact with teachers as part of their formal role in the organisation. Due to that, it is common for their degree of centrality to be above average and for them to be key players in the analysed implementation networks. The heads of studies supervise the work of teachers, regulate the number of students per class, address

conflicts, co-manage the budget, carry out administrative tasks and communicate identified needs to the school management team.

However, in absolute terms, the role that appears most often with three or more relationships corresponds to the regular classroom teachers. Especially those teachers who have already taught to the students participating in the programme have a direct influence on their performance and guide the facilitators on the characteristics of the children they are in charge of. Also, especially in the case of *Metodologías Flexibles*, specific help from them is sought in relation to English, Maths or other subjects in which they are experts. In all schools there are some teachers who are particularly motivated by their teaching work and actively influence their colleagues throughout the school year. They sometimes mention other teachers who organise extracurricular, cultural or sporting activities that, because of their preventive value, contribute to fulfilling the aims of the programme.

With regard to peers working in the same programme, the exchange of instrumental support is commonplace. They usually collaborate in the design of materials and the development of guides, or substitute for each other when necessary. There is also a process of socialisation, whereby those with more experience provide advice and guidance to novice facilitators.

3.4. Relational content during the implementation process

In terms of the content of interactions, teachers mentioned peers with whom they collaborate in the implementation of the programme, other colleagues who provide logistical support and a small group of instrumental support providers. Firstly, the activities of the programme are the central focus of the implementation process. For this, teachers rely primarily on peer-to-peer collaboration. However, formal coordination roles in schools also have a high centrality in the networks of relationships. They are responsible for ensuring the necessary logistical support for an adequate development of the intervention. In addition, they promote the integration of the programme with the rest of the activities of their educational institution. Finally, specialised instrumental support influences coverage, prevents participants from dropping out and provides the right conditions for implementation.

Based on the descriptions provided by respondents for each *alter*, we

have summarised in Table 4 the most frequent support exchanges that occur during programme implementation. The vast majority of respondents (86.27%) collaborate with peers in the design and implementation of programme activities. On average, they use about three teachers from the school where they work for this purpose. On the other hand, almost two thirds (65.69%) receive logistical support, with the material resources and space needed to implement the programme. Most often, it is the head of studies who takes care of that. As shown in Table 4, the remaining exchanges consist of specialised instrumental support.

No differences were observed between the programmes in relation to the support received for the implementation of activities. However, *Metodologías Flexibles'* implementers had on average more logistical support (M = 1.18, SD = 1.04) than *Pisotón's* implementers (M = 0.68, SD = 0.58; with t = −2.371, p < .007). Conversely, the latter had more support from kitchen staff (t = 3.854, p < .0001).

Overall, the qualitative interpretation is consistent with the above description. We have depicted it in Fig. 2, which summarises the qualitative analysis conducted by two independent observers. As far as relational content is concerned, direct collaboration between teachers in the design and implementation of programme activities is the central element. Moreover, the process of socialisation and learning is particularly important among teachers, based on the exchange of help and advice between those with more experience in the programme and those who joined more recently. It is also necessary to connect with teachers from previous years in order to facilitate personalised supervision for each student.

"Rosina, Alicia and Yadira have been implementing *Brújula* for many years. They are experienced and know the methodology well. Aura and Claudia are regular classroom teachers: although they do not know the programme so well, they have helped me a lot with the materials". [MF0212, *Brújula* teacher].
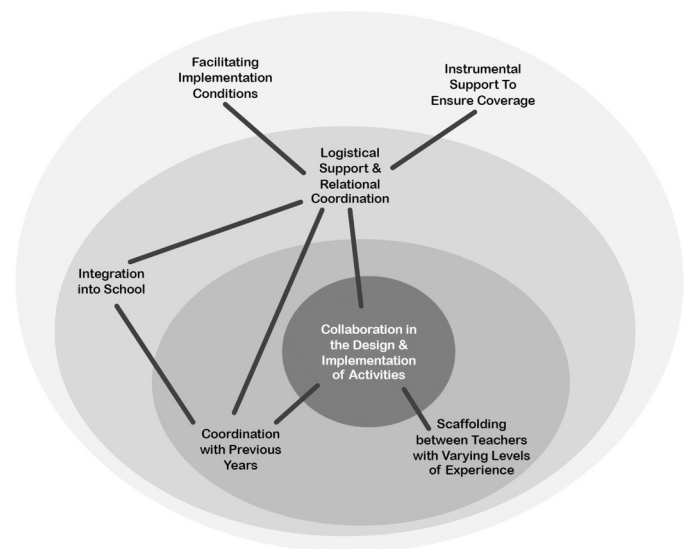
"Carolina is the teacher who has been working on the *Aceleración del Aprendizaje* module for the longest time. That's why she is the one who guides, supports and follows the newer teachers". [MF1201, *Aceleración del Aprendizaje* teacher].

Secondly, the coordination activities carried out by the school principals and heads of studies at the schools are once again of particular importance. They usually provide logistical support, lead the teams and facilitate the integration of the programme into the life of the school. In practice, they act as intermediaries between the programme and the educational institution. In a more peripheral position, occasional collaborations were observed, by auxiliary staff, who were in charge of providing the right conditions for the implementation of the programme and, at the same time, ensuring sufficient coverage.

"The head of studies is my line manager. She leads on all the pedagogical processes in primary education. She addresses my concerns directly, and she is also the one who receives my input and

Fig. 2. Qualitative description of the interactions at schools during program implementation.

suggestions for process improvement". [JF0909, *Aceleración del Aprendizaje* teacher]

"The two kitchen assistants make sure that the children's snacks are always ready, while the janitor makes sure that they don't stay out or go out on their own. Ultimately, this kind of help is essential". [EF0708, *Pisotón* teacher]

The qualitative validation served as an element of triangulation, insofar as the respondents' subsequent description of their personal networks helped to interpret the structural properties and individual roles in each case. Moreover, the description of the support exchanges that take place during the implementation of the programme shows that this is a highly complex process, which cannot be understood just as the coordination (between facilitators) during the implementation of the planned activities.

4. Discussion

The programme implementation networks revealed the existence of both formal and informal coordination mechanisms. On the one hand, those responsible for the study programmes in the institution are closely connected with the teaching staff, as required by the appropriate development of their day-to-day work. On the other hand, teachers collaborate with each other to ensure the successful implementation of the programme. In the latter case, coordination is not limited to the exchange of instrumental support for the delivery of planned activities, but also includes strategies that are put in place to facilitate the integration of the programme in the school. Accordingly, the coordination between educational levels, for example, becomes very important in order to facilitate the monitoring of students, together with the ongoing collaboration with regular classroom teachers. This finding coincides with that of previous studies, in which cohesion and intermediation processes coexist, to different degrees, in the implementation of programmes (Maya Jariego & Holgado, 2021; Neal & Neal, 2019).

The most prominent figures among the teaching staff stand out both because they have more experience in education (or in the specific implementation of the programme) and because they show a high degree of teaching commitment. They are generally teachers who are highly motivated to achieve effective learning outcomes and contribute to the personal development of their students. As previous research has shown, teachers' experience is related to their teaching practice (Copeland et al., 1994) as well as to performance indicators (Cibulka,

Table 4
Support exchanges during programme implementation.

Types of support	N	%	M	SD
Implementation				
Support in activity building and implementation in accordance with programme guidelines	88	86.27	3.63	2.320
Logistical support				
Creation of spaces, times and materials for programme implementation.	67	65.69	1.00	0.933
Instrumental support				
Looking after children when the teacher is temporarily absent	21	20.59	0.29	0.669
Preventing children from dropping out of the programme, joining criminal gangs or starting to consume drugs	21	20.59	0.25	0.539
Preparing and serving food to students	26	25.49	0.40	0.748
Ensuring suitable cleaning standards for the delivery of the programme	34	33.33	0.44	0.712

2009) and career development (Borman & Dowling, 2008).

The descriptive study showed the existence of two dominant relationship patterns during the implementation of the programme. On the one hand, there are cohesive networks formed by groups of teachers at schools that are highly integrated from a relational point of view. On the other hand, there are cases where the implementation is organised around coordination figures, with a more specialised instrumental involvement of school staff. This differentiation is important insofar as the degree of structural cohesion could be related to fidelity in the implementation of the programme. In addition, the effectiveness of schools in fulfilling their educational functions often relies on teachers having a shared vision, agreeing on their teaching models or strategies, and perceiving their educational goals and practices in a similar way (Fuller & Izu, 1986; Kratz et al., 2015).

The configuration of professional relationships among teachers seems to correspond in part to the organisational context and the degree of institutionalisation of the developed programme. This is particularly significant insofar as it could condition both the fidelity of implementation and the sustainability of the interventions in the medium term (Maya Jariego et al., 2022). One of the programmes analysed, *Pisotón*, is implemented in smaller educational institutions and, accordingly, forms smaller and more dispersed operational units. *Metodologías Flexibles*, on the other hand, is not only integrated into larger educational institutions, but forms more stable and cohesive structures. While the former is organised as an external programme dependent on individual practitioners, the latter is part of a larger organisational framework in which more consolidated teams are developed.

The core of the teachers' professional networks consists of a small group of colleagues with whom they collaborate in the design and implementation of programme activities. However, in addition, there are other figures who provide logistical and instrumental support to make these activities feasible. These are usually the school principal, head of studies, psychoeducational advisors and auxiliary school staff. This is in line with science-practice transfer models, which have shown that along with innovation capacities, organisational capacities such as staff training, technical support, leadership or the development of an appropriate climate, among others, are necessary too (Wandersman et al., 2008).

These previous observations are especially relevant if we take into account that a strong differentiation of professional roles can lead to a relational segregation of services. For example, in programs aimed at children, the relationships of social workers and social educators are often segregated from each other, with little mutual interaction (Quiroz-Saavedra et al., 2017). In these cases, the users are the only ones who connect the different programs, which increases their relative power in relation to the professionals. Hence the importance of knowing how the programs are articulated in relational terms.

4.1. Practical implications

After studying the *Pisotón* and *Metodologías Flexibles* programmes we have revealed the importance of having cohesive teams of teachers (and, by extension, an appropriate organisational climate) to ensure the successful development of interventions. More specifically, the existence of groups of teachers who actively collaborate with each other is related to fidelity of implementation. Accordingly, the relational component is one of the levers that can be used to improve the implementation of

interventions. In fact, in an informal way, teachers who have more experience in implementing programmes already tend to play a role of guidance, training and support for colleagues with a shorter professional career.

Secondly, heads of studies are a key figure in schools and are also instrumental in the implementation of the programme.[6] They not only prepare the organisational context for the planned activities to take place, but also act as mediators between the different members of the organisation. This is why they can be called upon to facilitate the adjustment of the programme to the specificities of each educational institution.

Moreover, the functioning of the programme partially depends on its integration at each school. It is therefore important that the facilitators are well connected with the regular classroom teachers, or that they maintain a relationship with the teachers of previous years in order to supervise each student properly. This facilitates adaptation to the context and the development of relationships between different stakeholders, which are key strategies to facilitate the implementation of evidence-based practices (Cook et al., 2019). As has been observed in different contexts, both the internal relationships between the teaching team (Woodland et al., 2021) and the networks between organizations (Valente et al., 2008) can be determining factors in the effective functioning of the programs.

Psychoeducational program administrators can benefit from using network analysis in project design, management, and monitoring. On the one hand, obtaining systematic information on the exchanges that take place at school reveals the real informal patterns of coordination, beyond the formal structure previously designed for the entire educational system. This is especially relevant if we consider that in each school the programs can be expressed in a different way, depending on the context receiving the intervention. On the other hand, schools may vary in the degree of centralization in decision making. Consequently, administrators at the highest levels of the educational system must modulate their leadership style depending on the type of school they are addressing. In some cases, it may be sufficient to contact the principal or head of studies to display an adequate level of program implementation in a specific school. However, in other cases, participatory management styles, open to a broader audience, will be necessary. Therefore, the managerial behaviour must be adapted to the specific relational context of each school.

As far as program administrators are concerned, it is also pertinent to provide for the technical assistance, preparation, and support mechanisms for teaching staff necessary to guarantee adequate development of the program. One possibility consists of incorporating the role of "fidelity coach", with a person who trains, continuously monitors, and evaluates the performance of teachers (King-Sears et al., 2018). This facilitates the adoption of evidence-based practices, as well as their effective implementation (Dunst et al., 2013).

4.2. Limitations and future research

In this study, we examine the professional exchange networks mobilised by teachers during the implementation of the *Pisotón* and *Metodologías Flexibles* programmes in 72 educational institutions in Barranquilla. It is to be expected that both the composition and the structure of these networks will vary according to the programme and the context of implementation. Therefore, the results cannot be directly generalised to other organisations and other intervention programmes.

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[6] The role of the heads of studies was particularly prominent in the case of the *Metodologías Flexibles* programme. In this case, they coordinate the implementation with an external operator and manage places for incoming students, along with the places for *Brújula* students to progress to the next level, in *Aceleración de Aprendizaje*. They also make arrangements for classrooms to be available outside school hours.

Instead, it is necessary to explore the diversity of forms that networks take depending on specific implementation contexts. In that sense, the typology of networks that we have described in this study seems a promising approach to characterise the implementation process in each case. On the other hand, the implementation networks were described from the point of view of the facilitators, and it is highly probable that other stakeholders have a different point of view about the structure of the interactions that take place in the schools.

Another element to be explored, according to this particular study, is the impact of organisational factors on the implementation of interventions. Thus, the organisational climate of each educational institution could have an impact on the type of more or less cohesive professional networks that are developed in practice. We also observed that affective involvement on the part of teachers, or more generally empathy for the circumstances in which their students live, had a positive influence on the implementation of the programme. Motivational factors could influence the quantity and quality of the activities finally implemented. Consequently, the interaction between organisational context and individual motivation is another topic of interest for future research. In this regard, attention should be paid to the size of the educational organizations in which the programs are implemented.

This case study also shows the potential of personal network analysis for operational monitoring of programme implementation. The systematic examination of the different sources from which facilitators obtain the resources needed for the successful delivery of programme activities allows for a better understanding of how interventions work. Consequently, relational data can be used to review and improve existing programmes, both in terms of efficiency and effectiveness (Valente, 2012; Valente et al., 2015).

In addition, a better understanding of the different relational configurations that emerge out of programmes could improve our ability to modulate the way in which they are implemented. Our study revealed that the use of free recall name generators has enormous potential in this regard, since it makes it possible to identify which actors are relevant from the point of view of the facilitators, without a priori restricting which professionals are relevant and which are not. In this case, the name generator was aimed at collecting the most frequent relationships in the work context of the school. Future research could delve into the provision of social support, the exchange of information, and other types of relationships.

Finally, it should be considered that brokerage positions are often exposed to tensions that hinder transfer processes, or that have indirect negative consequences in organizational contexts (Burt, 2005; Kislov et al., 2017). This makes it necessary to explore in future research what are the conditions in which intermediaries make a positive contribution, paying special attention to the formation of teams responsible for science-practice transfer (Kislov et al., 2017).

5. Conclusion

The facilitators of psychoeducational programmes collaborate intensively with each other in the implementation of activities. However, they also develop relationships with regular classroom teachers and heads of studies, which are essential for the successful implementation of the programme. Operationally, the relationships external to the group of facilitators contribute to the integration of the programme into the organisational context, as well as to its adaptation to the local context. Following an inductive approach, through the analysis of personal networks, we differentiated one type of implementation based on the formation of cohesive teams and a second type more focused on coordination roles. Personal networks with greater structural cohesion showed a positive association with perceived fidelity in programme implementation. As our case study shows, network analysis techniques are not only useful for describing the progress of programme activities but could be intentionally used to improve the implementation process.

5.1. Lessons learned

The positive association between facilitator team cohesion and fidelity in program implementation is consistent with our expectations and previous research. What was novel in our study was discovering the relevant role played by other members of the program facilitators' environment in each school. This could be detected thanks to the inductive approach of the analysis of personal networks through which the contacts that the facilitators mobilized to implement the program activities were openly identified (following the "free recall" technique). This showed that the implementation of the program does not depend only on the personnel directly linked to it, but on other members of the organizational context. These complementary professional roles seem to play a relevant role in adaptation and community fit strategies in the implementation of programs.

Consent to participate

The teachers signed an informed consent form, with guarantees of confidentiality hggjand aggregated processing of the information.

CRediT authorship contribution statement

Isidro Maya Jariego: Conceptualization, Methodology, Data analysis, Writing – original draft, Writing- review & editing, Supervision. **Munoz Andrés Muñoz Alvis:** Conceptualization, Investigation, Data curation, Data analysis, Writing – review & editing. **Daniel Villar Onrubia:** Data curation, Visualization, Writing – review & editing.

Declaration of Competing Interest

Authors declare no conflict of interest.

Data availability

The data that support the findings of this study are available on request from the corresponding author.

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