

# Behavioral profiles related with distinct developmental patterns of negative emotionality from preschool to school ages

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## Abstract

Research continues to work towards a full understanding of the early risk factors and mechanisms underlying the co-occurrence of externalizing and internalizing problems. There is increasing evidence of negative emotionality predicting the co-occurring forms of these problems over childhood. This feature may show substantial stability along development; however, negative emotionality might also vary depending on child characteristics, environment, and the developmental stage. The present study aimed to examine the patterns of stability and change of negative emotionality from preschool to school years, and to identify which of these patterns lead to different behavioral profiles of externalizing and internalizing problems during school years. A total of 1,293 preschoolers from 4 to 6 years ( $M = 4.64$ ;  $SD = .67$ ; 50.2 % girls) were followed-up for two years using parent-reported data, within the frame of the *ELISA* Project. Latent profile and transition analyses were conducted. The overall results revealed a primarily stability pattern of negative emotionality, and to a lesser extent some change towards a less intense emotional expression after follow-up. Results also showed particular developmental patterns of negative emotionality for the different behavioral profiles identified. Children with co-occurrent externalizing and internalizing problems displayed greater rates of transition towards a high negative emotionality expression. These findings were explained in light of individual differences during the development of temperamental characteristics, which may be the result of an interplay among biological and ecological factors.

*Keywords: negative emotionality; externalizing and internalizing problems; co-occurrence; latent profile and transition analysis.*

## Resumen

*Perfiles comportamentales y su relación con patrones diferenciales de desarrollo de la emocionalidad negativa desde la etapa preescolar a la escolar. La investigación continúa profundizando en torno a los mecanismos explicativos tempranos relacionados con la presencia de problemas externalizantes e internalizantes concurrentes. Existe una creciente evidencia que destaca la capacidad de la emocionalidad negativa para predecir la concurrencia de estos problemas durante la infancia. Este rasgo parece cursar con una estabilidad sustancial durante el desarrollo; no obstante, también se reconoce cierta variación en su intensidad en función de las características individuales, del entorno y la etapa del desarrollo. El objetivo del presente trabajo es examinar los patrones de estabilidad y cambio de la emocionalidad negativa que exhiben niños/as con perfiles diferenciales de problemas externalizantes e internalizantes, centrando la atención sobre el perfil concurrente. Un total de 1293 niños/as de 4-6 años ( $M = 4,64$ ;  $DT = .67$ ; 50.2% niñas) fueron evaluados durante la etapa preescolar y tras dos años hasta su paso a la escolarización primaria dentro del marco del Proyecto *ELISA*. Se emplearon análisis de perfiles y transiciones latentes. Los resultados mostraron que los preescolares se mantuvieron estables en sus niveles de emocionalidad negativa durante el seguimiento, y con menor probabilidad cambiaron su expresión emocional hacia formas menos intensas. Además, los perfiles comportamentales se relacionaron con patrones particulares de desarrollo de la emocionalidad negativa. Los niños/as del perfil concurrente exhibieron una mayor probabilidad de evolucionar hacia niveles altos de emocionalidad negativa. Estos hallazgos se explican a la luz de las diferencias individuales en el desarrollo de las características temperamentales, derivadas de la interacción entre factores biológicos y ambientales.*

*Palabras clave: emocionalidad negativa; problemas externalizantes e internalizantes; concurrencia; análisis de perfiles y transiciones latentes.*

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## Introduction

Externalizing and internalizing problems represent broad-band domains of conduct, emotional, and social behaviors commonly employed to depict childhood psychopathology (Achenbach et al., 2016). Externalizing problems are defined as under-controlled (i.e., defiant, oppositional, aggressive and hyperactive behaviors), while internalizing problems are described as over-controlled (i.e., anxiety and depressive symptoms) (Achenbach & Edelbrock, 1978). The *trans*-domain co-occurrence of these problems is a common phenomenon during childhood (Angold et al., 1999; Lilienfeld, 2003), which has often been related to greater symptom severity, higher rates of functional deterioration, and poor treatment outcomes when compared with differentiated expressions of these problems (Fanti & Henrich, 2010; Oland & Shaw, 2005). However, research is still endeavouring to unravel primary questions about the emergence of co-occurrent externalizing and internalizing problems (McElroy et al., 2018; Willner et al., 2016). One of these questions concerns the existence of a common vulnerability for externalizing and internalizing problems (Cosgrove et al., 2011; Mikolajewski et al., 2013; Waszczuk et al., 2020). Research suggests that co-occurrence may be explained by individual and environmental factors which were related to both domains of problems. Regarding the individual side, there is increasing evidence of the predictive power of temperament characteristics in child maladjustment (Chen et al., 2014; Eisenberg et al., 2009; Oldehinkel et al., 2004). Specifically, both externalizing and internalizing problems have been consistently related to a great intensity of emotional reactions during childhood, which is usually identified as negative emotionality (Lilienfeld, 2003; Mikolajewski et al., 2013; Oldehinkel et al., 2004; Rhee et al., 2015; Tackett et al., 2013). Noticeably, the overall findings about risk factors for co-occurrence, in which negative emotionality is included, has been mainly derived of studies conducting separate analyses for externalizing and internalizing problems. Therefore, there is a definite need of including a multivariate perspective in the study of the emergence and development of co-occurrent externalizing and internalizing problems (Eisenberg et al., 2009; Mikolajewski et al., 2013; Tackett et al., 2013). At this respect, throughout latent class and profile models, children with differentiated and co-occurrent behavioral profiles can be identified and compared to explore predictors and outcomes related to each distinct profile. Longitudinal studies are also required to examine not only early predictors of such co-occurrence, but also the stability and change of the predictors over time. Wichstrøm and colleagues (2017) suggested that time-invariant factors, as genes or stable parenting, might have an important role on the continuities of externalizing and internalizing symptoms. Further research is needed to examine the effect of stable risk factors on child psychopathology, with particular regard to co-occurrent externalizing and internalizing problems.

With regards to temperamental dimensions, literature suggest that these are prone to show substantial stability over development, even during childhood (Kopala-Sibley et al., 2018, Neppel et al., 2010). However other studies posited that individual characteristics may depend on environmental conditions, specially across early development (Lewis, 2001). Of note, still little research has examined the development of negative emotionality features from early childhood, and most of these studies have taken a variable-centered perspective (e.g., Kopala-Sibley et al., 2018, Neppel et al., 2010). In other words, these studies have accounted for universal patterns of stability and change of this feature in a given population of children. Complementing this perspective, longitudinal studies with a person-centered

approach can reveal further information about the differing patterns of stability and change on negative emotionality among children. In this regard, a latent transition model using negative emotionality as an indicator can identify subgroups of children based on their levels of negative emotionality and, subsequently examine children's probabilities of changing among these subgroups over time. This may provide detailed information on the developmental patterns of negative emotionality along childhood, but also might contribute to identifying the distinct mechanisms throughout negative emotionality could lead to differentiated and co-occurrent forms of externalizing and internalizing behavior. In this sense, latent profiles and transition models may help to explore different developmental patterns of negative emotionality within homogeneous subgroups of children relative to their particular behavioral profile.

The overall purpose of the present study is to explore the patterns of stability and change of negative emotionality from preschool (T1) to school ages (T2), and the relation of such patterns with different behavioral profiles based on externalizing and internalizing problems during school ages. To achieve this general objective, we aimed, firstly, to identify latent profiles based on combinations of anxious (ANX), depressive (DEP), oppositionist/defiant (OD) and attentional deficit/hyperactive (ADH) symptoms in children at T2. On the basis of former studies accounting for latent classes or profiles of internalizing and externalizing problems during childhood (Basten et al., 2016; McElroy et al., 2017; Willner, et al., 2016), we expected to distinguish behavioral subgroups which are quantitatively (severity degree) and qualitatively (behavioral pattern) different. Amongst such behavioral profiles, it is anticipated the presence of a profile exhibiting a co-occurrent pattern with comparatively higher rates of internalizing and externalizing symptoms. Secondly, we examined the patterns of stability and change amongst three mean-levels of negative emotionality (low, medium, and high) from preschool (T1) to school years (T2) by using a latent transition model. We expected that each mean-level of negative emotionality followed a primarily stable pattern, but with certain probability of change from an upper to a lower level of this feature. This might be in accordance with studies that posited a decline in negative emotionally levels over childhood (Murphy et al., 1999; Sallquist et al., 2009). Thirdly, we aimed to explore whether the behavioral profiles were associated to particular patterns of stability and change amongst the three mean levels-subgroups of negative emotionality. We expected that children exhibiting a co-occurrent behavioral profile during school ages had higher probabilities to persist into a high-level of negative emotionality from preschool years. This hypothesis is based on studies suggesting that stable risk factors might predict maladjustment, as well as on studies which related high-level of negative emotionality to children exhibiting a co-occurrent form of externalizing and internalizing problems.

## Method

### Sample

The present study utilized data from 1,293 preschool children from the general population who participate in the ELISA Project (*Estudio Longitudinal para una Infancia Saludable; Longitudinal Study for a Healthy Childhood*). The ELISA Project is an ongoing prospective study conducted in Galicia (North-Western Spain) to analyse developmental pathways for child conduct, emotional behavior, and psychosocial adjustment starting from early childhood. Participant children (50.2% girls) came from 72 schools located in urban, sub-ur-

ban and rural areas of Galicia. The greatest portion of the sample were Spanish, with only the 5% of participants reporting a different nationality, and no recorded nationality for the 5.6%.

Data was collected from questionnaires completed by the primary caregiver (mostly mothers) at baseline (T1 = 2016-2017; child age = 4.64,  $SD = .67$ ) and follow-up (T2 = 2018-2019; child age = 6.67,  $SD = .70$ ). Only participants with complete information in these two assessment times were included in data analysis.

## Measures

*Behavioral problems* were assessed using the parental version of the Children Behavior Checklist 6-18 (Achenbach & Rescorla, 2001). Four CBCL DSM-Oriented Scales were included: anxiety problems (ANX), depressive problems (DEP) oppositional defiant problems (OD), and attention deficit/hyperactivity problems (ADH). The item-response scale was three-point Likert type (0 = not true; 1 = somewhat or sometimes true; 2 = very true or often true). These scales have proved to be psychometrically sound (Achenbach & Rescorla, 2001). In our study, reliability obtained by each scale was relatively high, with alpha coefficients ranging from .70 to .80, except for DEP scale whose coefficient was .53.

*Negative emotionality* at preschool and school years was assessed using Emotionality subscale (tendency to distress) of the Emotionality Activity Sociability Temperament Survey (EAS) for Children: Parental Ratings (Buss & Plomin, 1984). EAS item-response scale is five-point Likert type (1 = "my child's behaviour is never like this"; 5 = "my child's behaviour is always like this"). Reliability of this scale over the assessment points was also relatively high, with coefficients of .70 at T1, and .73 at T2.

## Procedure

ELISA Project procedures comply with all standard ethical standards, with data collection for the current study having been approved by the Bioethics Committee of the Universidade de Santiago de Compostela and the Spanish Ministry of Economy and Competitiveness. Heads of schools accepted the conditions and agreed to be part of the study; then families were contacted. An active consent form was filled out by the families who agreed to participate in the study, and was collected by preschool teachers, who were also authorized to complete a teacher-version of the questionnaire for participant children. Both preschool teachers and one of the parents/caregivers chose between filling out the questionnaire by paper form or online. All the questionnaires were key-coded in order to guarantee confidentiality. Participants had one month for completing and returning the questionnaire. Neither preschool teachers nor parents/caregivers received any economical compensation for their participation. The present study only included data reported by caregivers.

## Data Analysis

This study implemented latent variable mixture modelling with cross-sectional and longitudinal data. To accomplish the first objective of these study, a *Latent Profile Analysis* (LPA) was applied to identify subgroups of children based on similar patterns, or *profiles*, of behavioral problems. LPA is a person-oriented method employed to identify homogeneous latent profiles of individuals using a set of continuous indicators (i.e., ANX, DEP, OD and ADH). To accomplish the second objective, an autoregressive model designed as an exten-

sion of latent class and profile analyses for longitudinal data, *Latent Transition Analysis* (LTA), was conducted to describe children stability and change amongst three negative emotionality mean-levels (low, medium, high) from T1 to T2. These means levels were previously estimated running LPA of negative emotionality as a single indicator (these analyses were not detailed in this manuscript). Finally, we included the latent profile solution as a covariate in the LTA of negative emotionality to examine the stability and change patterns of this feature related with each of the behavioral profiles (third objective). All the analyses were run in Mplus version 7.4 (Muthén & Muthén, 1998-2015). These analyses are further described below.

### Objective 1. Behavioral profiles at school years

We explored sample descriptive statistics for the observed variables used in the analyses. Then, we performed a sequence of LPA solutions ranging from 3 to 6 profiles. Such LPA solutions were estimated using MLR for maximum likelihood estimation with robust standard errors. Best Log Likelihood (LL) for all models must be replicated more than two times for trustworthy solutions. To compare models and determine the empirically best solution regarding the number of profile groups, fit indices were examined: Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and Sample-Adjusted Bayesian Information Criterion (SABIC); as well as the LL value. A lower value in these indices and a higher value of LL indicate a better fitting model. We also revised the Bootstrapped Likelihood Ratio Test (BLRT) and the Lo-Mendel-Rubin Likelihood Ratio Test (LMR) to compare a solution with  $K$  number of profiles with a solution with  $K-1$  profiles. Entropy (ENT) was also considered, as values closer to 1 are representative of better classification, in the sense of higher differences between profile groups. Complementing the empirical results of the fittest model, we based our final decision on interpretability and the theoretical support for the latent profile solution considering previous research.

### Objective 2. Stability and change of negative emotionality from preschool to school years

Secondly, we examined whether the measurement model of the three mean-subgroups (low, medium, high) on negative emotionality varied across time points. Of note, these means were, respectively, 2.17, 3.12 and 4.20 at T1 ( $SD = .44$ ); 2.23, 3.18 and 4.28 at T2 ( $SD = .48$ ). We used LRT to compare a full measurement non-invariance (or freely estimated) model with a full measurement invariance model, which assumed equal means for the negative emotionality levels-subgroups across time points.

Considering the results from the invariance test, we ran a first-order LTA with one transition point (T1 to T2) and no covariates. This first-order transition model addressed the stability and change allowed for a direct effect between T1 and T2. As a result, the information was represented in probability matrices, where diagonal values described stability, or individuals in time  $T$  who remain in the same profile assigned in  $T-1$ , as well as off-diagonal values which describe the movement among profiles, indicating individuals in time  $T$  who came from a different profile assigned in  $T-1$ .

### Objective 3. Stability and change of negative emotionality as a function of behavioral profiles

The final latent behavioral profile solution selected in Objective 1 was included as a covariate to the LTA of negative emotionality conducted for Objective 2. This may allow to recognize the transitional patterns amongst the mean-levels of negative emotionality within homogeneous subgroups of children in terms of their behavioral profile. Logistic regression coefficients were obtained to calculate the transition probabilities matrices for each behavioral profile. The

statistical effect and significance of those coefficients addressed the behavioral profiles differences to be placed within and move among the mean-levels of negative emotionality, compared to their probability of being in a “reference group”. The reference group was a profile with the lowest values in ANX, DEP, OD and ADH symptoms.

**Results**

**Objective 1. Behavioral profiles at school years**

Means, standard deviations, and ranges of the studied CBCL scales at T2 are shown in Table 1. Overall, ADH was the most common behavior, followed by OD, ANX and finally DEP in schoolers of 6-8 years old.

Table 1. Descriptive statistics of the CBCL-Oriented Scales at school years

Scale	Mean (SD)	Range
ANX	.393 (.311)	1.67
DEP	.175 (.203)	1.22
OD	.443 (.400)	2.00
ADH	.508 (.421)	2.00

Based on these CBCL scales, LPA solutions were explored to identify the best fitting model. Table 2 shows the enhancing of model fit as profiles were added, with a continuous decrease in BIC, AIC and SABIC, and an increase in LL. Moreover, LMR and BLRT remained significant for all solutions, pointing towards an improvement in the loglikelihood difference distribution when further profiles were added to the model. The ENT value of the 4-profile solution were the highest in comparison with the remaining solutions, showing a good class separation.

Table 2. Model fit information for LPA solutions of behavioral problems at school years

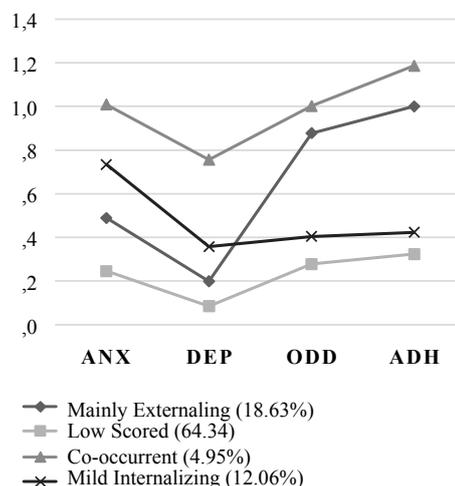
#P	AIC	BIC	SABIC	LL	$\rho$ LMR	$\rho$ BLRT	ENT	SPS (%)
3	1.424.142	1.517.106	1.459.929	-694.071	.010	< .001	.829	6.88
4	1.151.139	1.269.927	1.196.868	-552.569	.042	< .001	.833	4.95
5	943.640	1.088.252	999.310	-443.820	< .001	< .001	.830	3.48
6	840.497	1.010.933	906.108	-387.248	.046	< .001	.832	1.72

Note. #P= Number of Profiles in the LPA solution; SPS= Smaller Profile Size.

As the statistical fit parameters did not provide a concise indication of the best profile solution, we based our decision criteria on the interpretability, conceptual appropriateness, and parsimony of the model. Behavioral patterns in the 3-profile solution differed only in terms of intensity, while more descriptive information was provided by the models from the 4-profile solutions onwards. In this sense, the 4-profile model largely classified children into categories of “low scored” and “mainly externalizing” behavior, but also into two smaller categories of “mild internalizing” and “co-occurrent” behavior. The “mild internalizing” emerged into the 4-profile solution without splitting any of the previous 3-profile solution. The 5-profile model was also conceptually meaningful but was discarded because it added subgroups with less than 4 percent of the sampled children. The 6-profile solution was discarded for the same reason. We ultimately accepted the 4-profile solution as the simplest and most meaningful model.

Also, the behavioral patterns traced by such profile solution were supported by former studies using latent class and profile analysis (Basten et al., 2016; McElroy et al., 2017). Percentages and plotted means of the four profiles are depicted in Figure 1. A Bonferroni test revealed significant differences between these profiles in the assessed behavior, with the exception of the “co-occurrence” and “mainly externalizing”

Figure 1. ANX, DEP, OD and ADH behavior means for the 4-profile solution at school years



profiles, whose OD mean score did not differ.

**Objective 2. Stability and change of negative emotionality from preschool to school years**

We firstly tested measurement differences on emotionality levels across time points to assure that change the three mean-levels of negative emotionality is not due to measurement differences. The full measurement non-invariance model obtained worse fit when compared with a full measurement invariance model ( $X^2 diff(3) = 1.216, p = .749$ ). This indicates that the three negative emotionality mean-levels identified in T2 did not vary with respect to T1. Table 3 displays model fit information used to test the measurement invariance.

Table 3. Model fit information for measurement invariance of the three levels-subgroups of negative emotionality across T1 and T2

	#Par	AIC	BIC	LL	SCF	ENT
Full invariance	9	6.284.604	6.331.087	-3.133.302	.964	.597
Full non-invariance	12	6.289.507	6.354.484	-3.132.753	.949	.601

Note. #Par= Number of Free Parameters; SCF= Scaling Correction Factor for MLR.

Accordingly, we imposed a full measurement invariance restriction on LTA to explore child stability and change amongst the three negative emotionality levels from preschool (T1) to school years (T2). Overall, most of the schoolers remained stable in the emotionality subgroup in which they were initially classified during preschool ages. Amongst the children who changed their emotionality level, the most moved towards a less intensity level. Thus, children initially assigned on the high negative emotionality level were the most likely to move, transitioning mainly towards a medium level of negative emotionality.

Table 4. Transition probabilities of change among negative emotionality level-subgroups considering their sizes

Negative emotionality levels at T1 (row)	Negative emotionality levels at T2 (columns)		
	Low (n = 366)	Medium (n = 714)	High (n = 213)
Low (n = 348)	.993	.000	.007
Medium (n = 706)	.113	.856	.031
High (n = 239)	.003	.243	.753

Table 4 shows latent transition probabilities between T1 and T2.

### Objective 3. Stability and change of negative emotionality as a function of behavioral profiles

The 4-profile solution based on CBCL subscales were included as a covariate into the previously identified LTA model. We found that schoolers of the “co-occurrent” profile were more likely to transit towards a high negative emotionality than to a medium emotionality subgroup when compared to children of the “low scored” profile ( $B = 31.746, p < .000$ ). It is worth stressing that there were zero probabilities for children assigned to the “co-occurrent” profile to transition towards a low level of negative emotionality. Thus, the “co-occurrent” profile was related with transitions probabilities towards upper levels of negative emotionality.

Moreover, children of the “mainly externalizing” and “mild internalizing” profiles were less likely to move towards a low negative emotionality than to a medium emotionality level ( $B = -27.657, p < .000$ , and  $B = -169.009, p < .000$ , respectively), when compared to the “low scored” profile. It is worth considering that schoolers assigned to these profiles who initially exhibited medium or high levels of negative emotionality had zero probabilities to transition towards the lower level of negative emotionality at T2. Table 5 shows the stability and change probabilities amongst emotionality levels for each of the four behavioral profiles.

Table 5. Transition probabilities among negative emotionality levels-subgroups for the 4-profile solution

Negative Emotionality levels at T1 (rows under profile labels)	Negative Emotionality levels at T2 (columns)			
Mainly Externalizing	Low	Medium	High	
	Low	.376	.624	0
	Medium	0	.875	.125
	High	0	.109	.891
Mild Internalizing	Low	Medium	High	
	Low	.632	.368	0
	Medium	0	.952	.048
	High	0	.257	.743
Co-occurrent	Low	Medium	High	
	Low	0	.551	.449
	Medium	0	0	1
	High	0	0	1
Low Scored	Low	Medium	High	
	Low	1	0	0
	Medium	.379	.618	.002
	High	.075	.774	.151

## Discussion

The overall purpose of the present study is to explore the patterns of stability and change of negative emotionality from preschool to school ages, which are exhibited by schoolers of different behavioral profiles based on externalizing and internalizing problems. To achieve this purpose, we firstly identified profiles based on ANX, DEP, OD and ADH symptoms among schoolers. Data analysis revealed that the best solution in terms of parsimony and conceptual appropriateness was to distribute schoolers on four profiles, labelled as follow: “mainly externalizing”, “mild internalizing”, “co-occurrent” and “low scored”. The structure of this four-profile solution replicated previous findings from studies that also employed LPA on externalizing and internalizing problems during childhood (McElroy et al., 2017; Willner et al., 2016). As expected, children who exhibited a co-occurrent profile had higher ANX, DEP, OD and ADH symptoms when compared with children assigned to the remain profiles. The only exception was for OD symptom rates, which were similar in the co-occurrent and mainly externalizing profiles.

Secondly, we explored child probabilities to change amongst three different mean-levels of negative emotionality (low, medium, and high) from preschool to school years. Results revealed that high negative emotionality in preschoolers tend to continue through school ages drawing a primarily stable pattern (Kopala-Sibley et al., 2018). Notwithstanding, and according to what was hypothesized, some children were involved in declining developmental patterns of negative emotionality. Most of preschoolers who showed such patterns progressed from a high-level to a medium level of negative emotionality. This apparent discontinuity on negative emotionality could be attributed to the development of self-regulation skills (Murphy et al., 1999; Sallquist et al., 2009), but also might respond to changes on how these characteristics are expressed over developmental periods. Moreover, the transitioning among measurement invariant levels of negative emotionality from preschool to school years might support the idea that temperament is not just biologically, but also environmentally, determined. In this sense, some studies have showed individual differences in patterns of emotionality related with parenting, which could significantly interfere in how children express emotions (e.g., Lipscomb et al., 2011). Further research is required to identify the social processes that potentially interfere in the progression of the distinct patterns of child negative emotionality (Taraban & Shaw, 2018).

As a third aim, we examined the stability and change of negative emotionality related with different latent behavioral profiles. This objective was set in an exploratory way to account for the developmental patterns of negative emotionality from preschool to school years, exhibited by a subgroup of schoolers with co-occurrent externalizing and internalizing behavior. We observed that these children followed high stable patterns of negative emotionality from preschool to school years. Moreover, those in the co-occurrent profile who showed initially low or medium levels of negative emotionality tended to increase this emotional expression. These findings suggest that children who exhibit both externalizing and internalizing problems may have a high probability to reach greater expressions of negative emotionality, as indicated in previous studies (Lilienfeld, 2003; Mikolajewski et al., 2013; Oldehinkel et al., 2004; Rhee et al., 2015; Tackett et al., 2013). However, a high stable course of negative emotionality might not be specifically related to the co-occurrent profile. Thus, children identified into the “mainly externalizing” and “mild internalizing” profiles could also be involved in a stable pattern of high negative emotionality. Nevertheless, most of the children belonging to these

later profiles might experience greater probabilities of decreasing their negative emotionality when compared with the “co-occurrent” profile. In this sense, there is a clearer drawing of the courses of negative emotionality for children with co-occurrent externalizing and internalizing problems, but such courses may be overlapping amongst behavioral profiles. Further research is needed to address the question of which processes are involved in the similar courses of negative emotionality that lead to different behavioral outcomes during childhood. The transactions between adverse environmental factors and child temperamental profiles have been recurrently examined in order to explain child maladjustment (e.g., Chen et al., 2014). Nevertheless, as commented Liu et al. (2019), novel research needs to rigorously examine the developmental trajectories of the complex interaction among children and their environment and the subsequent adjustment outcomes. On this basis, to unravel why similar courses of negative emotionality might lead to different profiles, it would be necessary to consider not just the interplay of individual and ecological variables, but also developmental particularities (i.e., stability/change) of such interactions.

Our results must be view in light of the following limitations. Child behaviors were reported by child caregivers, which were mainly mothers. Further research should include multiple informants (i.e., fathers and teachers) as well as lab-based and home-based observations of behaviors, in order to enhance measurement methods (Alexander et al., 2017; Kopala-Sibley et al., 2018). Moreover, our sample considered children from the general population of rural and urban areas of Galicia, but is still limited in terms of ethnic diversity. Future research should test the cross-cultural generalization of these findings over both clinical and community-based samples.

Despite limitations, the presented findings might contribute to the general understanding of child co-occurrence by examining how negative emotionality develops in those children who exhibit simultaneously internalizing and externalizing problems. This temperamental behavior seems to depict different longitudinal patterns depending on child behavioral profiles. Among them, the patterns of negative emotionality related with a co-occurrent profile were not unique, but overall were the most defined in terms of the potentiality to be described. Children with co-occurrent externalizing and internalizing problems might experience stable courses of high negative emotionality from preschool to school years. It is worth to stressing that the co-occurrent profile was also related with an increased intensity on the negative emotionality expression. Thus, children in the remaining profiles experienced a declining pattern of negative emotionality that the ones in the co-occurrent profile did not. Together, these results pointed towards a need to better understand the specific mechanisms underlying co-occurrent externalizing and internalizing problems, which would require a deeper investigation into the complexities of the interplay between biological and environmental variables.

## Acknowledgements

The authors would like to thank all the members of the ELISA Project team for contributing to data collection and preparation. We would also like to extend our gratitude to the many families and school teachers who supported and participated in this study.

The authors declare no conflict of interests

## Fundings:

This study was funded by the FEDER/Ministerio de Ciencia, Inno-

vación y Universidades – Agencia Estatal de Investigación (PSI2015-65766-R); the Axudas para a Consolidación e Estruturación de Unidades de Investigación Competitivas e outras Accions de Fomento nas Univeridades do SUG, GRC 2018/Consellería de Cultura, Educación e Ordenación Universitaria, Xunta de Galicia; and the Programa de ayudas para la Formación de Profesorado Universitario/Ministerio de Ciencia, Innovación y Universidades (FPU17/01799).

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