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Predictors of emotional problems in 5-year-old children

Predictors of emotional problems in 5-year-old Children: An international comparison between two cohorts in Chile and Scotland

Abstract

Emotional problems in early childhood increase the risk of mental health problems into adolescence and adulthood, but the cross-cultural etiological risk factors are unclear. We examined predictors of emotional problems in preschoolers, using a national cohort of children in Chile and in Scotland. Participants included 1,648 children and their families enrolled in the Chilean Encuesta Longitudinal de la Primera Infancia (ELPI) cohort and 3,786 children and their families enrolled in the Growing Up in Scotland (GUS) cohort. Data were collected between 2005 and 2012. Information on emotional problems along with social and health determinants were collected via maternal reports. Emotional problems in the clinical range were identified in 10.4% of children from the ELPI cohort and in 3.6% of children from the GUS cohort. The difference between cohorts was statistically significant. Logistic regression revealed that maternal unemployment predicted emotional problems across cohorts. Lower maternal education and living in rural areas predicted higher risk of emotional problems for the ELPI cohort only, whereas having a younger mother, daily parent-child shared activities such as a lower frequency of sharing letters/shapes, and a higher exposure to television predicted higher risk for emotional problems for the GUS cohort. Maternal unemployment as a risk factor across cohorts indicates the importance of shared cross-cultural factors. However, sample specific differences highlight the importance and need for greater attention towards cultural specificities in policy and intervention development for child mental health.

Keywords: Emotional problems; Chile; Scotland; Cohorts; Epidemiology.

Introduction

Emotional problems in childhood denote emotional distress and emotional symptoms, which have in turn been associated with anxiety and depression (Bayer et al., 2012). During the preschool years in particular, children experience a rapid development of their cognitive, social, emotional and behavioral skills, but our understanding of the nosology of preschool mental health problems and disorders is still far from complete, especially as compared to our understanding of these issues in older children (Angold and Egger 2004).

The existing literature has shown that emotional problems may start early in life, and may present rates and patterns of comorbidity similar to those seen in later childhood (Egger and Angold 2006; Insel and Fenton 2005). Additionally, early emotional problems (i.e., anxiety and depression) which are chronic, have been associated with sustained mental health problems into adolescence and adulthood (Morgan, Farkas and Wu 2009; Sourander 2001), and evidence continuity over time (Bayer, Sanson and Hemphill 2006). Earlier onset of emotional problems are increasing in prevalence (Egger and Angold 2006), which poses a substantial public health burden. Early emotional problems have also been positively associated with learning difficulties, peer difficulties and/or victimization, school dropout, and poor vocational prospects (Reijntjes, Kamphuis, Prinzie and Telch 2010; Stewart-Brown 1998). Therefore, a better understanding of the etiology of these problems, considering health, social, and contextual determinants at the family, maternal, and child-level, could help inform early prevention initiatives.

To improve our understanding of the etiology of these problems, reliable and valid screening methods for emotional problems in children are needed. Screening through observation or interview methods poses problems in terms of reliability and cost-effectiveness, whereas rating scales with clear cut-off points are considered as the "gold standard" for the monitoring of

children's problems (Braet et al. 2011). Rating scales based on parental assessment of the child also have inherent biases, including reporter bias, halo effects, and systematic measurement errors due to item weightings (Achenbach et al. 2008). Despite these limitations, parental rating scales confer benefits in terms cost-effectiveness and balancing scalability with reliability, increasing their use in the assessment and understanding of children's problems (Achenbach et al. 2008; Braet et al. 2011).

Predictors of emotional problems

A number of antecedent risk factors for emotional problems have been identified. At the family level, these include: low socioeconomic status (SES) (Morgan et al. 2009; Ashford, Smit, Van Lier, Cuijpers and Koot 2008), single-parent families (Kalff, Kroes, Vles, Bosma, Feron, Hendriksen et al. 2001), parental discipline (Bayer, Ukoumunne, Mathers, Wake, Abdi and Hiscock 2012; Leve, Kim and Pears 2005), over-involved/protective or low warmth/unengaged parenting (Bayer et al. 2006), and parents' own mental health (Bayer et al. 2006; Leve et al. 2005). At the maternal level, stress (Ashford et al. 2008; Bayer et al. 2012), less education and lower employment occupation status (Anselmi, Piccinini, Barros and Lopes 2004; Kalff et al. 2001), along with younger maternal age (Kalff et al. 2001; Moffitt 2002), have been identified as increasing offspring risk for emotional problems. At the child level, preterm birth and low birth weight have been found to predict emotional problems, albeit with small effect sizes (Aarnoudse-Moens, Weisglas-Kuperus, van Goudoever and Oosterlaan 2009; Arpi and Ferrari 2013). The agreement between different studies on these predictors suggests that these factors could be culturally invariant "universal" predictors.

Other potential antecedent determinants of emotional problems have yielded more equivocal results. For example, some studies report higher emotional problems for children from

rural areas (Hope and Bierman 1998; Lyneham and Rapee 2007), while others suggest increased risk in urban areas (Zahner, Jacobs, Freeman and Trainor 1993), or no significant differences (Srinath et al. 2005). Maternal smoking and alcohol use during pregnancy have also been associated with increased emotional problems in some studies (Höök, Cederblad and Berg 2006; Robinson et al. 2008; Sood et al. 2001), but not in others (Batstra, Hadders-Algra and Neeleman 2003; McCrory and Layte 2012). Similarly, sibling status has been reported as both a risk and protective factor for emotional problems (Anselmi et al. 2004; Harland, Reijneveld, Brugman, Verloove-Vanhorick and Verhulst 2002). Findings for risk in relation to gender are similarly equivocal (Crijnen, Achenbach and Verhulst 1997; Morgan et al. 2009; Robinson et al. 2008). These findings suggest that some factors could, in contrast, be considered more "cultural-specific" predictors.

Other predictors have been less considered, so support for their association with emotional problems is more limited e.g., breastfeeding, which has been suggested to be a protective factor buffering against the development of emotional problems (Girard and Farkas 2019; Robinson et al. 2008; Liu, Leung and Yang 2014). Also, very few studies have considered family time or shared parent-child activities. A marginal association was observed between sharing family time, active leisure, and emotional problems (Hofferth and Sandberg 2001). There is also evidence that early shared book reading is beneficial for child development, with daily reading predictive of improved childhood socioemotional skills (O'Farrelly, Doyle, Victory and & Palamaro-Munsell 2018). Conversely, some parenting practices such as "low warmth", (characterized as a lack of involvement and caring towards children), reduce the amount and quality of time spent with the child and is predictive of early childhood emotional problems (Bayer et al. 2006). Finally, higher exposure to TV in the preschool years has been associated

with a higher frequency of emotional problems, although evidence is somewhat mixed (Carneiro, Dias and Soares 2016).

Whilst a substantial existing literature aims to understand these antecedent risk factors (e.g., Ashford et al. 2008; Morgan et al. 2009), very few studies simultaneously consider health, social, and contextual factors, providing an incomplete understanding. Further, there are few studies that examine potential consistencies and differences in etiology across countries and cultures, with most studies conducted in single samples, or using North American and European cohorts. Arguably, greater attention should be paid to different settings that provide complementary information about the universality or localized effects of potential predictors. The current study aimed to address these methodological shortcomings by examining health, social, and contextual factors in the etiology of emotional problems at age 5, using two national cohorts of children from Chile and Scotland. We focus on children at age 5 given this age coinciding with entry into the formal schooling system across countries, whereby the emergence of emotional problems may become more apparent with the increased exposure to peers and the demands of the early school environment (e.g., Girard and Girolametto, 2016).

Emotional Problems and Country Specific Contexts

Studies in different countries on children's emotional problems show varying rates of prevalence between 12-29% (Belfer 2008), and 25-48% (Rescorla et al. 2007). A possible explanation for these discrepancies is that different countries, due to specific cultural characteristics, are exposed to different risk and protective factors (e.g., educational and economical disadvantages, prenatal and postnatal care, and stimulation activities at home). Similarly, culture defines and creates specific sources of distress and impairment for children, affecting how different symptoms are interpreted (Kieling et al. 2011). Thus, comparative studies

examining the similarities and differences of prevalence rates, alongside examination of predictors of emotional problems in different countries, could enhance our understanding and better inform public policy planning. In addition, the impact of social determinants of mental health on child development may change as a function of societal context and time, as in the case of middle income settings transitioning to high income (e.g. Chile) or in response to changing social policy directions (e.g. changes in Scotland's health and social care policy in the wake of late 20th century deindustrialization). These contextual factors may also interact with individual differences at the family level, but may be nested within other demographic factors, further indicating that international comparisons between countries may be of value.

For instance, Chile and Scotland are both countries characterized by substantial urban/rural variations, with the majority of the population concentrated largely around a small number of metropolitan areas, and the remaining population geographically dispersed. Both countries also have decreasing birth rates. Moreover, both countries have also recently enacted long term strategic health system changes related to a greater focus on early intervention and prevention in public mental health (Ministerio de Salud MINSAL 2017; National Plan of Mental Health and Psychiatry; Scottish Government's Mental Health Strategy 2017-2027). However, there are also differences in social determinants of mental health between countries, with Chile classified as having one of the highest global rates of wage inequality and income concentration at the top of the occupational hierarchy, although with greater social mobility than other high resource countries such as Scotland (Castillo 2011). Both countries also face challenges in relation to equitable access to treatment across different social classes.

Related to cultural values and how this may affect parenting beliefs across countries, Hofstede's model (Hofstede 1991) characterizes Chile as having a greater power distance (the

way a culture addresses status differences) and uncertainty avoidance (the way a culture deals with ambiguity and instability) than the UK, which means that relationships are more vertical (e.g., teacher-child, parent-child). A more prominent theory, the cultural orientation model by Schwartz (2006), suggests that UK culture (which represents the culture of a Western European country) emphasizes intellectual autonomy, egalitarianism, and harmony more than other regions, and comparatively, is less concerned with hierarchy and embeddedness. In contrast, Chile (a Latin American country) is close to the worldwide average in all the orientations suggested by Schwartz. The Latin American culture is described as collectivist (Hofstede 1991; Triandis 2001), and compared with Western European countries such as Scotland, this seems to be so. The Latin American culture places a greater emphasis on hierarchy and embeddedness (the main components of collectivism) and less emphasis on intellectual autonomy (main component of individualism).

These cultural dimensions will influence parenting beliefs and behaviors, with Scottish parents more likely supporting individual and autonomous development in their children, promoting intellectual autonomy as creativity and curiosity, being more responsive to their children's signals, and supporting children's efforts, independence, and initiative. On the other hand, Chilean parents have more status differences and vertical parent-child relationships, placing greater value on stability while supporting more structured rules and social norms, and prioritizing social order and support values such as obedience, politeness, self-discipline, deference to authority, and children's regulation (emotional and behavioral) from very early ages. These cultural differences might play a role in predicting more emotional problems in Chilean children.

With regard to childhood difficulties, in international comparisons Chilean children present with substantially elevated rates of internalizing difficulties (Rescorla et al. 2011), and within-country comparisons suggest rates of between 10% and 15% for behavioral and affective problems for children living in the metropolitan region (Bralic, Seguel and Montenegro 1984; De la Barra, Toledo and Rodríguez 2003; Delgado, Zúñiga and Jadue 2006), and 21% for children in Southern Chile (Silva, Ortiz and Livacic, unpublished). Similarly, data from Scotland and the rest of the UK suggest a growth in childhood emotional difficulties, with prevalence rates of 11% in seven year-old children taking part in the Growing Up in Scotland (GUS) cohort (Parkes, Sweeting and Wight, 2014) and 14% in the UK Millennium Cohort Study (Hope, Pearce, Whitehead and Law 2014). This underscores the need for population cohort data to disentangle the role of universal and country-specific predictors of children's emotional problems.

The Present Study

In the current study we explored the prevalence of emotional problems in 5 year-old children in Chile and Scotland and assess health, social, and contextual factors in the etiology of these problems. In doing so, we used two methodologically robust, national cohort samples. Considering the higher rates of internalizing problems previously reported in Chile, as well as differences in socioeconomic and cultural characteristics, we expected a higher prevalence of emotional problems in Chilean children. Indeed, due to the associations between higher social and economic inequalities and mental health problems in children (Reiss 2013), we also expected that maternal sociodemographic predictors such as education and employment status (representing these inequalities) would be stronger predictors of emotional problems in the Chilean cohort. Further, given the high prevalence rates of breastfeeding in Chile (Farkas & Girard, 2019), we also expected breastfeeding to emerge as a protective factor for children in

Chile. On the other hand, given the relatively lower rates of population inequality in Scotland compared to Chile, we expected that family environmental determinants would emerge as more relevant in this cohort, along with certain maternal characteristics (age, pregnancy risk behaviors) and parent-child sharing activities. As a number of determinants (e.g., living in rural versus urban areas,) have yielded less clear-cut results concerning their possible associations with emotional problems, no specific hypotheses were made regarding these factors. Given the previously consistent support for associations with internalizing problems in other cohorts, we expected that single-parent families, younger maternal age, lower maternal education, and lower occupational status, would be associated with higher levels of emotional problems in children (Anselmi et al. 2004; Kalff et al. 2001; Moffitt 2002) from both cohorts, supporting the idea of "universal predictors".

Method

Design

This study used longitudinal survey data collected from two national cohorts of children in Chile and Scotland, comparing infant, maternal, and family level predictors of emotional problems at age 5. For both cohorts, sociodemographic information was collected at the first assessment (Time 1 for ELPI in 2010, Sweep 1 for GUS in 2005). When children were between 56 and 61 months, their emotional problems were assessed, using the Child Behavior Checklist (CBCL 1½-5 parent-version, in Spanish) for the Chilean sample (Time 2 for ELPI, 2012) and the Strengths and Difficulties Questionnaire (SDQ parent-version, in English) for the Scottish sample (Sweep 5 for GUS, 2010). Data pertaining to family activities in the GUS cohort only was collected at [enter sweep and year here in the same format as above]. All assessments were conducted in the families' home.

Participants

The Chilean cohort included children and their families participating in the "Encuesta Longitudinal de la Primera Infancia, ELPI," in 2010. This survey assessed children and their household context through their development and was representative of children born between January 2006 and August 2009, in both urban and rural areas across Chile. Initial recruitment included a total of 15,175 participating families, with children aged between seven and 58 months living in the household. All families with children were identified from the Chilean Civil Registry and Identifications Service. The final sample was selected through a probabilistic design using a two-step method, applying first cluster sampling (clustered by neighborhood) and then stratified sampling, ensuring a representative sample of Chilean children younger than 7 years old, representative of year of birth, across all Chilean regions, including both urban and rural areas. Families completed a sociodemographic questionnaire at Time 1 (2010), followed by a behavioral questionnaire of their child at Time 2 (2012; CBCL 1½-5). Inclusion criterion for the current study was children aged between 56 and 61 months at Time 2 (n=1,659), which was used to enable comparisons with the Scottish cohort. Children with incomplete behavioral questionnaire data (n=11) were excluded, resulting in a final sample of 1,648 families (10.9% of the original sample).

The Scottish cohort included families from "Growing Up in Scotland", (GUS, Birth Cohort 1); a longitudinal population cohort representative of children born in Scotland between June 2004 and March 2006, in both urban and rural areas. Families were identified on the basis of the cohort child's date of birth via Child Benefit records (Department for Work and Pensions, DWP). A letter was then sent to the Child Benefit recipient (normally the child's mother) inviting them to take part in the study. A total of 5,217 families with children between the ages of nine

and 12 months were initially recruited, with annual assessments thereafter. When children were between 56 and 61 months, parents also completed a behavioral questionnaire (SDQ). Children with incomplete data on the behavioral problems questionnaire in Sweep 5 (n=1,431) were excluded from the current study, resulting in a final sample of 3,786 families (72.6% of the initial sample).

The mean age of Chilean children included in this study was 58.4 months ($SD = 1.72$), of whom 49.9% were boys and 39.1% were only child. There were 82.0% of mothers who had completed secondary education and 10.3% had a university degree. A majority, 86.4%, were between 21 and 39 years of age. Moreover, 49.8% of the mothers did not work, and 89.9% of the families lived in urban areas. The Scottish children had a mean age of 58.2 months ($SD = 0.50$), of whom 51.0% were boys, and 47.5% were the only child. 77.1% of their mothers had secondary education completed, 59.5% had a university degree, and 91.4% aged between 21 and 39 years. 40.5% of the mothers did not work, and 79.7% of the families lived in urban areas. More demographic characteristics of the included families, alongside child behaviors, are displayed in Table 1.

A comparison of the entire ELPI and GUS cohorts and the families included in this study is presented in Online Supplement 1 (a and b). Only two differences were observed between the entire ELPI cohort and the sample included in this study, which included letters/shapes sharing (more frequent in our sample), and maternal age whereby there was a higher frequency of younger mothers in the initial cohort. No other differences were observed, which indicates that the Chilean sample included in this study was largely representative of the original sample. In contrast, although the Scottish sample for this study represented 72.6% of the original sample, differences between both samples were observed for almost all variables compared. More

families in the subsample studied lived in rural areas, with older mothers, who were working, and had higher education and occupation levels. Further, there was a higher frequency of alcohol use during pregnancy and higher rates of breastfeeding initiation in the current sample. On the other hand, mothers in the initial cohort reported higher frequencies of smoking during pregnancy, being single, with slightly older children, and had a greater frequency of low birth weight children, indicating that the Scottish sample included in this study differed from the original sample.

Ethics

The study was performed in accordance with the ethical standards of the 1964 Declaration of Helsinki and later amendments. Ethical approval for ELPI was granted by Universidad de Chile, conforming to the principles set out in the Declaration of Helsinki. GUS data were approved by Scotland' A' MREC committee (application reference: 04/M RE 1 0/59). The current study, using combined data, received ethical approval from our institutions.

Measures

Children's behavioral problems.

Child Behavior Checklist 1½-5 (CBCL): The CBCL 1½-5, used in the ELPI cohort, is parent-report instrument used to assess children's behavioral problems (Achenbach and Rescorla 2001), normed for use with children between 18 months and five years of age. It consists of 99 items, across seven subscales: emotionally reactive, anxious/depressed, somatic complaints, withdrawn, sleep problems, attention problems, and aggression. Each item is rated on a 3-point Likert scale from 0 (*not true*) to 2 (*very true or often true*), with higher scores indicative of more problematic behavior. Subscales can be grouped to provide an overall score on two domains (internalizing and externalizing). Raw scores can be translated to T-scores and can be interpreted

in the following categories: normal, risk (or borderline clinical), and clinical range (T-scores ≥ 64, raw scores ≥ 9) (Achenbach and Rescorla 2001). The CBCL 1½-5 has good reliability for the total scale (α=.95) and internalizing problems (α=.89) (Achenbach and Rescorla 2001) with US samples, including robust comparability for parental scores across 31 different countries (Rescorta el al. 2007). The scale has been validated in Chile, with good reliability indexes (α=.95 for total scale, α=.88 for internalizing problems) (Lecannelier et al. 2014).

Strengths and Difficulties Questionnaire (SDQ): The SDQ, used in the GUS cohort, is a parent-report instrument used to assess children's behavioral problems along with their prosocial behaviors (Goodman 1997). It is normed for use on children as young as two years old (Boyer, Miller, Connolly and McIntosh 2016) and comprises 25 items across five subscales: emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behavior. Each item is rated on a 3-point Likert scale ranging from 0 (*not true*) to 2 (*certainly true*), with higher scores indicative of more problematic behavior (with the exception of the prosocial behavior subscale). The raw scores are interpreted as close to average, slightly raised, high, and very high (Boyer et al. 2016) and the cut-off point suggested is ≥ 90th percentile (Goodman 1997), which corresponds to the high and very high categories. The instrument has good validity and reliability across different cultures, with good internal consistency in the UK (α=.82 for total score and α=.67 for emotional symptoms; Goodman 2001), other European countries (α=.75-.83 for total score and α=.61-.72 for emotional symptoms; Becker, Woerner, Hasselhorn, Banaschewski and Rothenberger 2004; Muris, Meesters and van den Berg 2003; Niclasen et al. 2012; Smedje, Broman, Hetta and Von Knorring 1999), and in Chile (α=.79 for total score and α=.65 for emotional symptoms; Brown, Capella and Antivilo 2014).

Although there are some differences between the measures, particularly in terms of item length, with 99 items in the CBCL and 25 items in the SDQ, both instruments have several similarities across their design and implementation. Both are designed to obtain ratings of children's problems, and can be used as brief general screeners to identify high-risk children. They are easily administered and translated into many languages, enabling their use with diverse cultural groups. Both assessments use the same item rating scale by people who see children in particular contexts (i.e. parent versions), and their ratings are summed to yield scale scores. Neither measure is designed to operationalize nosological criteria, but use of cut-off points for scale score distributions, with top-down selections of items to provide indicators of potential diagnoses (Achenbach et al. 2008). A large number of studies support the validity for the use of the CBCL with children from different countries (Rescorla, Adams and Ivanova 2020; Wild, Furtado and Angalakuditi 2012) and its equivalence across different parents' races or ethnicities, income levels and languages (Gross et al. 2006). A similar number of studies support the validity of the SDQ for use in different countries (Liang, Yang and Yao 2019; Ortuño-Sierra et al. 2015) and its equivalence in different ethnic populations (Mieloo et al. 2014).

Additionally there is support for the comparability between CBCL and SDQ. In a study comparing both instruments in a sample of 4-7 year old children in the UK, significant correlations were identified between CBCL total score and SDQ total score (r=0.87), and CBCL internalizing problems and SDQ emotional symptoms (r=0.74; all p<.001; Goodman and Scott 1999). Further studies using both community and clinical samples indicated similar correlations between CBCL and SDQ total scores, and CBCL internalizing problems and SDQ emotional symptoms, considering multiple countries including Belgium (.80 and .75; Braet et al. 2011), Germany (.78-.82 and .69-.73; Klasen et al. 2000) (.83 and .77; Becker et al. 2004), the

Netherlands (.74 and .70; Van Widenfelt, Goedhart, Treffers and Goodman 2003) (.72 and .62; Mieloo et al. 2012) (.70 for total scores; Theunissen, Vogels, de Wolff, Crone and Reijneveld 2015), Pakistan (.59 and .52; Syed, Hussein, Azam and Khan 2009), and Iran (.75 and .63; Shahrivar, Tehrani-Doost, Pakbaz, Rezaie and Ahmadi 2009). Finally, in a review of 48 studies of 4 to 12 years old children from European, Asian, Australia, North American and African countries mean correlations of .76 (.70-.87 range) for total scores and .64 (.44-.77 range) for CBCL internalizing problems and SDQ emotional symptoms were found (Stone, Otten, Engels, Vermulst and Janssens 2010).

Although there is extensive support for the comparability of both instruments using total scores and specific subscales, there is less literature on the use of the measures with cut-off points to detect children with and without problems. In this respect, some studies use an elevated CBCL total score as criterion, which defines T-scores $\geq$ 64 as high (clinical cut-off point) (Achenbach and Rescorla 2001), and then through ROC AUCs (Area Under receiver operation Curves) from the SDQ, which show sensitivity and specificity for all scores, to apply to the CBCL. Next, appropriate cut-off points can be chosen, with specificity of at least 0.90 in the sample, to determine sensitivity indices and related test characteristics. Using this procedure, the SDQ has demonstrated good validity, with sufficient discrimination between children with and without problems as measured by the CBCL (*r*=.70, *Cohen's K*=.59, sensitivity=.76 and specificity=.93; Theunissen et al. 2015). Alternatively, clinical diagnoses have been used as a criterion, analyzing the discriminative validity of the CBCL and SDQ total scores against verified psychiatric diagnosis. Using this approach, both instruments were equally able to differentiate between patients with and without any clinical diagnosis on axis I (AUC=.78 for the CBCL total score and AUC=.77 for the SDQ total score) and subscales could appropriately

detect more specific clinical subgroups, (AUC=.73 for the CBCL internalizing problems and AUC=.69 for the SDQ emotional symptoms) (Becker et al. 2004). Further, systematic review evidence of screening efficiency for both instruments showed no significant differences between the likelihood ratios calculated for the CBCL and SDQ within any of the domains evaluated or when used in clinic as opposed to community populations (Warnick, Bracken and Kasl 2008). Furthermore, the homogeneity of results indicated that any differences owed to population stratification were likely minor.

Predictor Variables

In the current study, the criteria used to select the predictors were that they were (a) empirically supported by the existing literature and (b) collected in both cohorts. All predictor variables were collected using questionnaires, which were completed by mothers. We examined the following factors as determinants. At the family level: area of family dwelling (urban/rural), presence of a partner/spouse in the household (yes/no), child has siblings (yes/no), and family activities including weekly frequencies of reading/sharing books with an adult at home (none, 1-3 days, 4-6 days, every day), working on/sharing letters/shapes with an adult at home (none, 1-3 days, 4-6 days, every day), visiting the park/playground (none or less than one day per week, 1-3 days, 4-6 days, every day), and daily average amount of time watching TV (none, less than two hours, 2-4 hours, more than 4 hours). Maternal predictors included maternal age (20 years or less, 21-29 years, 30-39 years, and 40 years or more), maternal education (primary complete or incomplete, secondary complete, vocational qualification, university degree), working status (yes/no), type of occupation (not working, semi-skilled/unskilled, non-manual/skilled manual, professional/managerial), smoking during pregnancy (yes/no), and alcohol use during pregnancy

(yes/no). For children, predictors were child sex (boy/girl), low birth weight (≥2500 grams, yes/no), and initiation of breastfeeding (yes/no).

[Table 1 here]

Statistical Analyses

First, a score for emotional problems was obtained using the anxious/depressed subscale in the CBCL 1½-5 for the ELPI cohort, and the emotional symptoms subscale in the SDQ in the GUS cohort. The anxious/depressed subscale in the CBCL 1½-5 considers eight items to be rated on a 3-point Likert scale from 0 (*not true*) to 2 (*very true or often true*): (10) Clings to adult or too dependent, (33) Feelings are easily hurt, (37) Gets too upset when separated from parents, (43) Looks unhappy without good reason, (47) Nervous, high-strung, or tense, (68) Self-conscious or easily embarrassed, (87) Too fearful or anxious, and (90) Unhappy, sad or depressed. The emotional symptoms subscale in the SDQ considers eight items to be rated on a 3-point Likert scale from 0 (*not true*) to 2 (*certainly true*): (1) Often complains of headaches, stomach-ache or sickness, (2) Many worries, often seems worried, (3) Often unhappy, down-hearted or tearful, (4) Nervous or clingy in new situations, easily loses confidence, and (5) Many fears, easily scared.

To identify children with and without emotional problems, a cut-off point of raw scores ≥ 9 (clinical range) was considered for CBCL (Achenbach and Rescorla 2001), whereas for SDQ scores were derived using a cut-off point of high/very high (or abnormal) corresponding to a raw score ≥ 5 (Goodman 2004). Frequency of emotional problems in both cohorts was then examined. Next, data from both cohorts were combined for analysis (*N* = 5,434). Bivariate analyses were conducted examining potential differences for all predictors (Fisher's exact tests, chi-squared tests and *t*-tests) between the ELPI and GUS cohorts. Alpha threshold was set to *p*

= .050. Finally, a logistic regression was conducted to examine predictors of emotional problems. Heterogeneity between cohorts was examined using cohort/predictor interaction terms. Analyses were also stratified by cohort. We use the term significant to denote statistical significance henceforth. Preliminary multicollinearity checks identified that maternal working status and occupation were highly correlated (r =.91, p = < .001; Online Supplement 2). Therefore only maternal working status was included in the multivariate analysis. For parsimony, predictors were only included if significant at bivariate level (α=.05).

Results

Bivariate Analyses

For the Chilean sample, 10.4% of children presented within the clinical range of emotional problems, with 12.4% located in the risk range, and 77.2% in the normal range. In comparison, only 3.6% of children in Scotland presented with emotional problems in this range (high/very high), 4.3% in the slightly raised category, and 92.1% in the close to average category. The difference between cohorts for the presence of emotional problems (10.4% for Chilean sample and 3.6% for Scottish sample) was statistically significant, x^2 = 98.07, p < .001 (see Table 1).

Bivariate analyses to examine potential differences in the determinants' frequencies between both cohorts revealed that a greater proportion of families in the Chilean sample lived in urban areas, were in single parent families, had older children, more siblings, and more mothers had initiated breastfeeding with the cohort child. On the other hand, mothers in the Scottish sample were older, were more likely to work, had higher education, and occupational levels. Mothers in the Scottish sample also reported engaging in higher-risk prenatal behaviors such as smoking during pregnancy, and alcohol use during pregnancy, and a greater frequency of the

children were of low birth weight. Finally, considering stimulation activities between parent and child, parents in the Scottish sample reported more frequently sharing books with their child, interacting more frequently with letters/shapes, and were more likely to visit parks/playgrounds. In addition, Scottish children had higher reported frequencies of TV watching compared to Chilean children.

Bivariate analyses to examine predictors of emotional problems showed that in both cohorts, a higher frequency of emotional problems were observed in children whose mothers had lower educational levels, who were unemployed, and had lower occupational levels. A higher frequency of emotional problems was observed in children from the Scottish sample with low weight at birth, who had lower levels of breastfeeding initiation, whose mothers were younger, and had no spouse/partner living in the home. Additionally, in Scottish sample only, a lower frequency of interacting with letters/shapes and a higher frequency of daily TV watching were more commonly observed in children with emotional problems. Finally, area of residence was also associated with emotional problems, but in different directions for each cohort – with urban living associated with lower emotional problems in Chile, but higher rates in Scotland (see Table 2).

[Table 2 here]

Determinants of Emotional Problems

The final model revealed a good fit for predicting emotional problems, $x^2_{(34)} = 182.83$, $p <$ .001 (see Table 3). The interaction term revealed area of living as significantly associated with the presence of emotional problems. However, when cohorts were observed separately area of living was a significant predictor for ELPI children only, with a higher frequency of emotional problems in Chilean children living in rural areas. The interaction term also showed maternal age

as significantly associated with the presence of emotional problems. But when cohorts were observed separately maternal age was a significant determinant for GUS children only, with children from the Scottish sample whose mothers were younger presenting with a higher frequency of emotional problems. Additional x^2-tests revealed significant differences between categories, $x^2_{(3)} = 20.79$, $p < .001$, with younger mothers more likely to have children with emotional problems.

The interaction term for maternal education was also significant. However, when the cohorts were observed separately, maternal education was only a significant determinant for ELPI mothers, with lower maternal education predicting greater risk of children's emotional problems. Additional analyses showed significant differences between categories, $x^2_{(3)} = 14.74$, $p = .002$, whereby lower levels of maternal education were associated with increased risk of emotional problems.

The interaction term for letter/shapes sharing and daily TV exposure were also significant, but when the cohorts were observed separately, they were significant determinants only for GUS children. Scottish children who interacted daily with letter/shapes presented with a lower risk of emotional problems, with significant differences for the letter/shapes categories, $x^2_{(3)} = 8.22$, $p = .042$. Indeed, a higher TV exposure predicted a higher risk of emotional problems in Scottish children, $x^2_{(3)} = 21.98$, $p < .001$.

Finally, maternal working status resulted in a significant predictor for both cohorts, with mothers' unemployment increasing the risk of emotional problems in Chilean and Scottish children.

[Table 3 here]

Discussion

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Our findings offer a number of contributions to understanding the etiology of emotional problems from a cross-cultural perspective. First, we report significant differences between the ELPI and GUS cohorts with children in ELPI reporting significantly higher rates of emotional problems than the children in the GUS cohort (10.4% versus 3.6%). For Chilean children, this rate is within the lower range of historical emotional problems estimates in the country (10-21%; Bralic et al. 1984; De la Barra et al. 2003; Delgado et al. 2006). However, this study uses a large, nationally representative sample of Chilean children.

The prevalence rate for emotional problems in Scottish children is similar to those previously reported prevalence rates (i.e., between 2.7-5.2%) using a representative UK sample (McCulloch et al. 2000), although the previous study used a different measure (Rutter Child Scale A) and age range (children aged between 7 and 18 years old). Our data are in contrast to more recent UK samples, using the SDQ which reported emotional problem rates of 11% to 14% in children aged 7 years old (Parkes et al. 2014; Hope et al. 2014). The difference in UK estimates could be accounted for by children's ages. However, both these studies reported cut-off points based on children scoring in the 'borderline' and 'abnormal' categories for total difficulties, which is equivalent to 7.9% of the children from our study. We opted to maintain the cut-off point of $\geq 90^{th}$ percentile suggested by the scale author, which corresponds to the abnormal three-band categorization, or high/very high four-band categorization (Goodman 1997, 2014).

The difference in prevalence rates between Chilean and Scottish children was partially anticipated due to the socio-economic and political factors in the Chilean health system (Ministerio de Salud MINSAL 2017). Chile is also characterized by high rates of SES inequality, which impacts upon access to, and quality of care for early interventions. There is also a higher presence of known antecedent risk factors for children's mental health difficulties (Anselmi et al.

2004; Kalff et al. 2001), such as lower levels of maternal education and higher rates of maternal unemployment in Chile as compared to in Scotland.

Previous literature suggests continuity of early emotional problems over time (Bayer et al. 2006), alongside associations with learning difficulties, peer difficulties, and school dropout, amongst others (Reijntjes et al. 2010; Stewart-Brown 1998). This suggests a substantial public health burden, especially for children in Chile given the higher prevalence rates found in the current study. Implications for public policy would suggest a strong focus on early detection, intervention, and prevention of children's mental health issues is needed.

For antecedent risk factors of childhood emotional problems, our analyses identified maternal unemployment as a predictor of emotional problems for both cohorts. Also, lower levels of maternal education was a predictor of emotional problems, but only for Chilean children. These findings are consistent with the existing literature identifying risk factors related to multiple familial adversity, including lower SES, education and occupation (Anselmi et al. 2004; Ashford et al. 2008; Morgan et al. 2009). We also note that maternal mental health was not captured in the current data, but that this predictor could itself be related to these other indicators of adversity whereby adversity contexts are associated with higher maternal stress, which could impact children's mental health (Chang et al., 2013). These results suggest that policies in both countries nest maternal mental health within policies to address broader social determinants of child and family health. This in turn, may help to reduce emotional problems in adolescence and adulthood, and the related future costs for the society.

Regarding other determinants, area of family dwelling was significant only for the Chilean cohort, whereby Chilean children living in rural areas had increased risk for emotional problems. This result has been observed in other studies that report higher internalizing problems

in children from rural areas (Lyneham and Rapee 2007), although other studies found more emotional problems in children from urban areas (Zahner et al. 1993). These differences may relate to differential access to support for parenting and mental health services, the amount of risk factors present, life quality, and poverty rates in rural/urban contexts, among others. Supporting this, Chilean families who live in rural areas also presented with lower educational and occupational levels and higher rates of unemployment (see online Supplement 2), suggesting nesting of adversity factors which then confer elevated risk for emotional problems. In contrast our Scottish data did not identify area as a significant predictor, although those Scottish families in the sample who lived in rural areas presented with higher levels of education.

Considering the associations between higher social and economic inequalities and mental health problems in children (Reiss 2013), we expected that sociodemographic maternal predictors such as education and employment status (and area of family dwelling, which also is related to those predictors), would be stronger predictors of emotional problems in the Chilean cohort. Our results supported our hypothesis, showing that when a certain social and economic baseline is not granted, this is going to have a great impact on children's mental health. The relevance of sociodemographic conditions also was observed in the Scottish cohort (as maternal working status). However, given the relatively lower rates of social inequality in Scotland compared to Chile, we expected that family environment determinants would emerge as more relevant in this cohort, as maternal characteristics and parent-child sharing activities. Our results supported our hypothesis, showing maternal age as a significant predictor in the Scottish cohort only, with lower maternal age increasing the risk of emotional problems, consistent with other studies from European samples (Kalff et al. 2001; Moffitt 2002). Also, family activities emerged as significant predictors, in the Scottish sample only. Daily parent-child activities such as sharing

letters/shapes were associated with a lower frequency of emotional problems, whilst higher exposure to television (not measured in previous similar studies) was related to higher rates of emotional problems. This is consistent with evidence that higher television viewing time is positively associated with children's social problems, psychological difficulties, delinquent and aggressive behaviors, and externalizing problems (Özmert, Toyran and Yurdakök 2002; Page, Cooper, Griew and Jago 2010). One possibility is that children watched more TV because they had less access to alternative activities and outdoor exercise, which in turn impacts on mental health. Alternatively, it is possible that children who were already experiencing low mood at baseline watched more television.

We note strengths in terms of the use of two nationally representative cohorts, which have not been previously compared, and the simultaneous consideration of health, social, and contextual factors. However, there are limitations. First, only 73% of children from the GUS cohort and 11% from the entire ELPI cohort were included in the current study to enable comparability on follow-up measures. We acknowledge attrition analyses showed differences between the GUS sample for this study and the entire cohort, impacting on generalizability of these results. Second, only predictors available for both samples could be considered in this study, which limit its conclusions. Future studies could incorporate other relevant predictors such as child characteristics (e.g., temperament) and additional maternal aspects (e.g., sensitivity, stress level). Third, the issue of shared method variance must be raised as all data were collected using maternal self-reports only. Future studies should consider using multiple raters and direct assessment. Fourth, we were constrained in our analytical strategy by the limitations of our datasets (e.g. lack of neighborhood level data in each country) which precluded the use of analyses such as multi-level modelling. Finally, two different parent-report questionnaires were

used. Although their comparability has been supported (Mieloo et al. 2012; Theunissen et al. 2015), future studies with the same instrument are suggested. Despite these limitations, our study points to a need to understand similarities and differences between population cohorts regarding the determinants of emotional problems. It also suggests that policy development and children's mental health initiatives need to balance their scope between universal and context-specific targets, consistent with the zeitgeist towards greater needs matching in global mental health.

In summary, our data offer an important perspective on the tension between universal and culture specific aspects of approaches to child mental health, underpinned by large-scale observational cohort data. For children in Chile it appears that contextual and demographic factors are more relevant in predicting emotional problems (e.g., area of dwelling, maternal education, maternal working status), thus indicating candidate targets for social policy and maternal empowerment. This suggests a need for social and economic interventions to address socioeconomic inequalities, and adequate funding of effective mental health systems. For children in Scotland, predictors of child mental health were more likely to relate to modifiable lifestyle characteristics, such as lower maternal age, letters/shapes activities and television watching, indicating that policy can be framed in terms of enhancing existing child mental health programs to incorporate these components. In both cases, our data highlight the importance of establishing and sustaining early intervention initiatives as key social and health drivers in optimizing child mental health outcomes. In this respect, our data offer support for the development of child mental health systems in both high-resource (e.g., Europe) and middle-to-high resource settings (e.g., South America).

Informed consent statement: Informed consent was obtained from the children's parents included in the study.

Data availability statement: The data that support the findings of this study are available from Centro de Microdatos, Universidad de Chile (ELPI) and UK Data Service (GUS), but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available.

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