

Cultural Influences on Parental Responses to Children's Pain

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Abstract

There is a scarcity of work examining the relationship between culture and pain-related caregiver behaviors. Moreover, no pediatric pain studies have examined the relationship between caregiver cultural values and pain-related caregiver behaviors, specifically, if this process is mediated by caregiver parenting styles and moderated by eco-social context. Based on cross-cultural developmental theories, this study hypothesized that eco-social context would moderate the relationship between cultural values, parenting styles, and pain-related caregiver behaviors; and that parenting styles mediate the effect of cultural values on pain-related caregiver behaviors. A cross-cultural survey design was employed using a convenience sample of 547 caregivers of 6-12-year-olds living in Canada ($n = 183$), Iceland ($n = 184$), and Thailand ($n = 180$). Multigroup structural equation modeling, showed that eco-social context did not affect which cultural model of parenting the caregiver adopted. Parenting styles mediated the relationship between cultural values and pain-related caregiver behavior. Vertical/horizontal individualism, collectivism, and authoritative and authoritarian-parenting styles positively predicted solicitousness. Vertical individualism and authoritarian-parenting style positively predicted discouraging behavior, whereas other predictors did not. The findings support the sociocommunication model of children's pain by showing that cultural context does affect parents' behaviors. They also corroborate with others' claims of solicitousness universality in a pediatric pain context. However, solicitousness may have different cultural meanings among individuals, and may be used in conjunction with discouraging behavior. The findings from this study have implications for theory development about culture and pediatric pain, but do not provide specific clinical recommendations.

Keywords: Culture, eco-social context, cultural values, horizontal-vertical individualism-collectivism, parenting styles, authoritative parenting, authoritarian parenting, pain-related parental behaviors, solicitousness, discouraging, structural equation modeling, mediation, moderation.

1. Introduction

Culture has long been viewed as an important factor in children's pain experiences [19; 64]. The sociocommunication model for example, suggests that culture has a strong effect on caregivers' pain assessment and management [20; 78]. Yet, the influence of culture is still poorly understood in pediatric pain [51].

Culture is a complex concept with many competing definitions [100]. Culture has been defined as "the accumulated beliefs, practices, attitudes, and values shared by a social collective. It can be construed as a lens through which one registers experience and that shapes and colors perceptions, interpretations, and responses to events" (p. 34)[22]. Cultural values, commonly identified as individualism and collectivism, provide a "set of lenses" to view the world, inform about what is valuable, acceptable, important, and right. These shared social assumptions influence human behavior [105].

Parenting is embedded in culture [7]. Culture is generally learned during childhood, where parenting styles play a significant role in maintaining, teaching, and transmitting culture between generations [21; 87]. Parenting styles are commonly categorized as authoritative, authoritarian, and permissive [8]. Here, parenting style is the context in which parents raise their children, emphasize their socialization goals, enforce values, and exhibit parenting practices [21]. In general, individualistic cultures (those that emphasize individual interests over group interests) tend to be more authoritative, but collectivistic cultures (that emphasize group interests) are more authoritarian in their parenting styles [23; 59; 97]. Cultural models of parenting theories suggest that every-day parenting behaviors (e.g., play) are influenced by societies' predominant cultural values, mostly through the mediation of parenting elements, like parenting style [25; 45; 47]. Furthermore, parents' eco-social contexts (e.g., western vs. non-

western) may moderate the association between these variables. The eco-social context comprises features of the environmental surrounding (e.g., geography) and socio-economic characteristics (e.g., education levels) [47].

Parental responses to child pain have a powerful influence on children's pain and well-being. Researchers generally find that pain-related parent responses like solicitousness, which encourages pain expression, and discouragement, which discourages pain expression, lead to negative child pain outcomes [4]. This literature is problematic because it is mostly confined to samples living in North America and Europe. Although the literature suggests that reassurance (one form of solicitousness) is an "ingrained" [65] pain-related parental behavior, especially in response to needles, this is based on small samples of the world's population of parents, and thus not readily generalizable to different cultural contexts. To our knowledge, only one study has explored the relationship between cultural elements, like individualism, and pain-related parent behaviors; however, this study only involved parents living in Canada [68].

We aimed to examine the association between cultural elements (cultural values and parenting styles) and pain-related parental behaviors (solicitousness and discouraging) in parent samples living in different eco-social contexts. It was hypothesized that eco-social context would moderate the relationship between cultural values, parenting styles, and pain-related parental behaviors; and parenting styles would mediate the effect of cultural values on pain-related parental responses. Figure 1 shows the hypothesized model and Table 1 the hypothesized relationships.

Please insert Table 1 here

2. Methods

2.1. Participants

Caregivers of 732 school-age children (6-12 years) from urban metropolitan areas in Canada (Halifax $n = 300$), Iceland (Reykjavik $n = 252$) and Thailand (Khon Kaen $n = 180$) responded to an invitation to participate. Of the 732 caregivers, 548 completed the survey. Of this, 183 were from Canada, 185 were from Iceland, and 180 were from Thailand. One participant was excluded from the Icelandic sample due to an excessive amount of missing data.

2.1.1. Recruitment and data collection

This study used samples from the general population. In Canada, participants were recruited using posters at various locations (e.g., libraries, grocery stores, and websites). A small number of participants were obtained through word of mouth. In Iceland and Thailand participants were recruited through public elementary schools.

Convenience sampling was used to select participants at all sites. To decrease potential sample bias, a set of inclusion criteria of individuals was created and enforced at all sites [31]. The inclusion criteria were (a) a child was between the ages of 6 and 12 years, (b) the caregiver was a resident of the chosen area in each country, (c) the caregiver understood the local language/dialect, and (d) only one caregiver per household could participate. Furthermore, the participants were explicitly informed that to participate, he or she needed to be a parent or a legal guardian of the child.

In Canada and Iceland, participants first read the study information letter and then indicated on the online survey “accept/consent” if they wished to continue. In Thailand, research assistants obtained a written informed consent from the parent/legal guardians before they participated in the study.

All participants completed a survey package that consisted of three main questionnaires and demographic questions. Parents were asked to respond to the survey by reference to only one child. At all three sites, data was accrued through self-administered questionnaires. Participants in Canada and Iceland used online questionnaires, and Thai participants used a paper-based version. The decision to use the paper-based questionnaire in Thailand was due to local Khon Kaen researchers’ assessment of the availability of the Internet.

Ethics approval was sought and received from all three study sites. In Canada, ethical approval was obtained through the IWK Health Centre Research Ethics Board. In Iceland, ethics approval was obtained from the National Bioethics Committee of Iceland. In Thailand, ethics approval was obtained from the Khon Kaen University Ethics Committee for Human Research.

2.2. Eco-social contexts

The selection of eco-social contexts was based on geography, economy, education levels, and cultural values (i.e., individualism-collectivism), as well as authors pre-established connections with local research communities [107].

2.2.1. Canada-Halifax

Halifax (population over 390,000) is the capital city of Nova Scotia (population over 921,000), one of Canada’s (population over 33 million) 10 provinces. The majority of the Halifax population is Canadian-born (90.6%), speaks primarily English (90%), and affiliates as Christian (74%)[95]. On the individualism-collectivism spectrum, scholars describe and rate

Canada as an individualistic-focused society [38; 39; 71; 98]. When comparing Canadian parents with parents from collectivistic cultures, Canadian parents consistently score higher on authoritative parenting (i.e. child-centered) [14; 59; 84; 97].

2.2.2. Iceland-Reykjavik

Reykjavik (population over 213,000) is the capital region of Iceland (population over 330,000), where the vast majority of Iceland's population lives [96]. The Icelandic nation is homogenous and cohesive, 93% of the population are Icelandic citizens that speak Icelandic, and 75% belong to the Evangelical Lutheran Church of Iceland (G. Hauksson, Statistics Iceland, personal communication, September 13, 2014). Iceland is a society with a unique combination of collectivistic and individualistic cultural values [69], but rated more individualistic than collectivistic [98]. With respect to parenting styles, studies show that authoritative-parenting and neglectful-parenting are the most commonly used styles by Icelandic parents [1; 5].

2.2.3. Thailand-Khon Kaen

The city of Khon Kaen (population over 140,000; KhonKaen.com, 2013), in the Isan region, is located in the northeastern part of Thailand (population about 68 million). The Thai population is homogeneous, and as of the 2000 census, 99.8% of the population in Khon Kaen was of Thai nationality, with 99.4% of Buddhist religious affiliation [66]. Thailand is described and ranked as a collectivistic society that builds on tradition and hierarchy [6; 38; 39; 41; 91; 98]. Parenting in collectivistic countries, including Khon Kaen [90], is traditionally described as being more authoritarian, intrusive, and restrictive than in individualistic societies [13; 85].

2.3. Measures

2.3.1. Translation of study measures

The translation process was an integral part of the study design, where the translation, review, adjudication, pretesting, and documentation translation model, or TRAPD, was applied to translate the main study instruments from English (source language) to Icelandic and Thai (target language) [33; 99]. This translation model starts with a source-language instrument, and through its five interconnected steps, ends with a target-language instrument. In the translation model an interdisciplinary group of individuals with widespread knowledge of the local language and culture gathered and used numerous procedures to maximize equivalence. For example, in the pretesting step, back-translation, qualitative interviews, and pilot testing techniques were used [35; 93]. The goal was to develop translations that “ask-the-same-questions.” This meant that, for the instrument to be culturally appropriate and relevant, in some cases it was necessary to adapt items to the specific context [34; 99]. If items could not be translated word-for-word, the reason was reported and coded using a coding system (language = 1, culture = 2, concept = 3, and measurement = 4). The coding system built on van de Vijver’s [108] adaptation categories: (1) *language driven adaptation*, which involves the accommodation for differences in language structures (e.g., gender specific sentences), and principles (e.g., directness); (2) *culture driven adaptation*, which involves accommodation for differences in cultural norms, customs and practices of communication (e.g., acceptability of emotional expression) and terminology characteristic (e.g., temperature); (3) *concept driven adaptation*, which involves accommodations for differences in familiarity and sameness of concepts across cultures (e.g., changing the names of institutions) and; (4) *measurement driven adaptation*, which involves accommodations for differences in familiarity with stimulus (e.g., pain faces), and the formatting of stimuli (e.g., if language is read from left to right or vice versa).

2.3.2. Parent response to child’s pain behaviors

The Inventory of Parent/Caregiver Responses to the Children's Pain Experience (IRPEDNA) [42] includes 37 self-reported items that capture three interrelated scales related to parental responses to their child's pain behavior: solicitousness, discouragement, and promotion of well-behavior and coping. The *solicitousness* scale (15 items) measures parents' positive reinforcement (e.g., "I will get home as early as I can") and negative reinforcement (e.g., "We take care of all his/her obligations and chores at home while he/she is in pain and discomfort") of a child's pain behavior. The *discouragement* scale (10 items) captures parental responses that ignore/discourage the child's pain (e.g., "I ignore him/her") and criticize the child's pain behavior (e.g., "I tell him/her not to complain so much"). The *promotion of well-behavior and coping* scale (12 items) captures parental responses that promote adaptive behaviors (e.g., "I tell him/her to ... listen to music or watch television") and coping (e.g., "I tell him/her that he/she can cope with the problem by saying things like "You're strong"). The IRPEDNA asks participants to rate statements on a 5-point scale as follows: 1 ("Never"), 2 ("Very Occasionally"), 3 ("Sometimes"), 4 ("Quite Often"), and 5 ("Always"). The scores indicate the degree to which a parent endorses a particular response. The scale with the highest overall mean indicates the preferred response for that parent. The English version is a translation of the original Catalan version. It has also been translated into Dutch [110] and German [37].

IRPEDNA has shown good construct (criterion) validity with Catalan samples and shown good Cronbach's alpha (.80–.89) in European samples (Catalan, Dutch; [42; 110]. Further, the IRPEDNA scale closely matches the German child-and-parent versions of the Pain-Related Parent Behavior Inventory at item level and scalar structure [37].

The translation process resulted in no deletion of items in neither the Icelandic IRPEDNA version or in the Thai IRPEDNA version. In the Icelandic version, all items except # 11, 20 and

25 needed language driven adaptation and one item (# 19) needed a culture driven adaptation. For the Thai version, all items except # 1, 11 and 37, needed culture related adaptation. The Cronbach's α -coefficient values for the solicitousness scale (Canada .88; Iceland .91; Thailand .85), promotion of well-behavior and coping scale (Canada .81; Iceland .83; Thailand .88) and for the discouraging scale (Canada .83; Iceland .75; Thailand .73) were adequate in all three samples. Even though the Cronbach's alpha was sufficient for the promotion of well-behavior and coping scales, it correlated highly with the solicitousness scale, especially for the Thai ($r = .77$) sample. Given that the solicitousness scale rendered to the study's main hypotheses, the promotion of well-behavior and coping scale was not used, but the solicitousness scale was.

2.2.3. Parenting styles

The Parenting Styles and Dimensions Questionnaire-Short Form (PSDQ-SF) [81] consists of 32 self-report items listing three parenting style scales: authoritative, authoritarian and permissive. The *authoritative* scale consists of 15 items measuring the dimensions of warmth, support, regulation, and autonomy granting (e.g., "I emphasize the reasons for rules"). The *authoritarian* scale consists of 12 items measuring the dimensions of verbal hostility, physical coercion, and non-reasoning/punitive (e.g., "I spank when my child is disobedient"). The *permissive scale* consists of 5 items measures indulgence (e.g., "I spoil our child"). The PSDQ-SF asks parents to rate the frequency of each type of behavior on a 5-point Likert-type scale (1 = "never" to 5 = "always"). A mean score is computed for each scale, with higher scores indicating higher levels of the construct. The PSDQ-SF questionnaire has shown to have concurrent validity [80], face validity [70], criterion validity (long version: [86]), and adequate psychometric properties [60]. Many researchers have tested this instrument cross-culturally.

Concept equivalence between the Chinese and the American versions of the authoritative scale and of the authoritarian scale is reported [114]. Measurement invariance of the scales has been observed in Lithuania [49], Turkey [70], and Japan [52].

The translation process resulted in no deletion of items in the Icelandic PSDQ-SF version or in the Thai PSDQ-SF version. In the Icelandic version all items needed a language driven adaptation. Also, in the Thai version one item (#10) needed a culture driven adaptation. The Cronbach's α -coefficient values for the authoritative parenting scale (Canada .85; Iceland .89; Thailand .90) and the authoritarian parenting scale (Canada .81; Iceland .72; Thailand .74) were adequate in all three samples. The Cronbach's α -coefficient values for the permissive scale was low in all three groups (Canada .68; Iceland .67; Thailand .55). Thus, this study did not use the permissive scale, only the authoritative and authoritarian scales were used.

2.3.4. *Cultural values*

The Individualism/Collectivism Scale (INDCOL; [89]) is a 32 item self-report measure listing cultural value dimensions describing how individuals perceive themselves and interact with others (Table 2). It consists of two main scales and four subscales. The two main scales are: (a) the *collectivism* scale (16 items) which represents individuals that emphasize interdependence between the individual and the group. Collective goals, norms, traditions, and authority figures are valued, and regulate individuals' behaviors and communications; and (b) the *individualism* scale (16 items), which represents individuals that emphasize independence of individuals from a group. Here, the value is on personal freedom and fulfillment of personal goals, where individual attitudes, rather than group norms, influence behavior and social communication. Thus, full emotional expression is expected and even necessary for personal well-being (Table 2; [103; 104; 106]).

Please insert TABLE 2 here

The collectivism scale consists of two subscales: the *horizontal collectivism* scale (8 items), which represents individuals who see themselves as interdependent and similar to others in a non-hierarchical manner (i.e., expects equality), and the *vertical collectivism* scale (8 items), which characterizes individuals as interdependent, but gives the goals of the group a higher priority than personal individual goals (i.e., inequality is acceptable). Similarly, the individualism scale consists of two sub-scales: the *horizontal individualism* scale (8 items) aligns with individuals who see themselves as independent, self-reliant, and unique, but not competitive (i.e., expects equality), and the *vertical individualism* scale (8 items) which describes individuals who emphasize their independence, self-reliance, uniqueness, and competition. The INDCOL asks participants to rate statements on a 9-point scale (1 = “strongly disagree” to 9 = “strongly agree”). A mean score is computed for each scale. The INDCOL has good construct (divergent and convergent) validity [89; 106].

INDCOL is one of the most respected and commonly used tools to measure collectivism and individualism [71; 72] and has been translated into multiple languages. The coefficient alphas for vertical individualism, horizontal individualism, vertical collectivism, and horizontal collectivism, with North American samples ranging between $\alpha = .47$ and $\alpha = .83$; European samples ranging between $\alpha = .53$ and $\alpha = .77$, and; Asian samples ranging between $\alpha = .46$ and $\alpha = .81$ [29; 30] [48; 79]. Factor analyses [89] and confirmatory factor analyses [17; 79] have demonstrated the defined subscales are relatively constant.

The translation process resulted in no deletion of items in neither the Icelandic INDCOL version or in the Thai INDCOL version. In the Icelandic version, 20 items (# 1,5,9, 10, 11, 12, 14, 15, 16, 17, 18, 20, 22, 23, 24, 25, 26, 28, 29, 31) needed language related adaptation, and 2 items (# 2, 7) needed culture driven adaptation. For Thai version, 3 items (# 21, 29, 31) needed language related adaptation. In this study the collectivism scale, and the horizontal/vertical individualism scales were deemed to have construct validity, but not the horizontal/vertical collectivism scales. Inter-subscale Pearson's correlations showed that the horizontal collectivism factor and vertical collectivism factors were highly correlated, especially for the Thai ($r = .81$) sample. Also, the internal-consistency reliability of the vertical collectivism scale was low in the Canadian ($\alpha = .63$) and Icelandic ($\alpha = .61$) samples. On the basis of these findings, the collectivism scale was used, rather than the vertical-horizontal collectivism subscales, in all further analyses. In this study, the Cronbach's α -coefficient values for the collectivism scale (Canada .76; Iceland .82; Thailand .91), the horizontal individualism scale (Canada .78; Iceland .75; Thailand .75), and the vertical individualism scale (Canada .82; Iceland .81; Thailand .69) were adequate in all three samples.

2.3.4. *Other variables*

All data concerning the demographics of the child and the caregiver was gathered using caregiver self-report. The respondent to the survey had to be either a parent or a legal guardian of the child. The *relationship of the respondent* to the child was coded as mother, father, stepmother, stepfather, legal guardian, sister, aunt, uncle, grandmother, and grandfather. Respondents indicated their *age* in the categories of 20–24 years, 25–29 years, 30–34 years, 35–39 years, 40–44 years, 45–49 years, 50–54 years, 55–59 years, 60–64 years, 65–69 years and 70+ years. Respondents' *marital status* was coded in the categories of married, common law,

divorced/separated, remarried, widowed, and never married. In addition, socio-economic information was collected, including *education* and *occupation* of the respondents and their spouses. Occupation was collected as an open-ended question. However, it was not possible to code those responses, particularly in the Thai sample, so that variable was dropped. Education level was assessed using an eight-level ordinal scale: less than 7th grade, junior high school graduate, some high school, high school graduate, trade school or community college, partial university (at least 1 year), bachelor's degree, and graduate school (including professional training such as doctor, dentist, or lawyer). An open-ended category called "Other" was included.

Apart from the child's age and sex, information about the *child's pain frequency* was collected by asking caregivers how often the child had experienced headache, stomach ache, back ache, joint pain, and other pain complaints in the last 3 months. Each of these was scored on a 5-point scale, with 1 being "Seldom or never," 2 "About once a month," 3 "About once a week," 4 "More than once a week," and 5 being "Most days" [94]. Further, participants were asked how many times in the last 3 months their child had stayed home from school due to pain using a 4-point scale: 1= "Never," 2 = "One to three times," 3 = "Four to six times," and 4 = "More than seven times." Finally, data pertaining to *chronic illness* and to *prior hospitalizations* were collected as binary variables (Yes/No).

2.4. Statistical analysis

Statistical analyses were conducted with IBM SPSS 20.0 statistical software and analysis. Structural-equation modeling (SEM) was conducted with the lavaan package in R statistical software, version 3.1.2 [77; 82]. Statistical significance was set at $p < .05$ unless otherwise noted. Frequency counts and percentages were used to describe the demographic backgrounds across

the three country groups. For assessing the similarity and differences of demographic backgrounds across three country groups, the ANOVA was used for numeric variables, and the Chi-Square (χ^2) test of independence for categorical variables. If main effects were significant, this was followed by pairwise comparisons.

SEM was used to understand how pain-related parental responses are affected by culture, and to ensure that the measurement tools used were cross-culturally invariant (comparable). As such, the SEM analysis consisted of two models: (1) the measurement model, which tested and ensured that the Canadian, Icelandic, and Thai versions of the IRPEDNA, INDCOL, and PSDQ-SF scales yielded cross cultural measurement invariance; and (2) the structural model, which examined how cultural parenting models affect discouraging and solicitousness responses across Canadian, Icelandic, and Thai samples. Due to multivariate normality violation, models were tested with robust maximum likelihood estimation (MLR) [53]. Goodness-of-fit indices used included: the root-mean-square error of approximation (RMSEA; $\leq .06$ indicated adequate fit), the standardized root mean square residual (SRMR; $< .08$ indicated adequate fit), the comparative fit index (CFI; $> .90$ indicated adequate fit); and the Tucker–Lewis Index (TLI; $> .90$ indicated adequate fit) [40; 50]. Models were deemed acceptable if at least three of these four indices showed adequate fit. Also, item parceling was used to increase model parsimony, and stability of all the latent constructs (factor). When using item parceling, two or more items are combined to create parcels, which are then used as observed indicators of the latent constructs in the SEM [32; 57]. No item was deleted and all relevant items were used when creating the parcels. To create the parcels, recommendations from Little [57; 58], and Matsunaga [63] were applied. Finally, bootstrapping (with 5,000 resamples) was also used to address nonnormality

distribution in data. The bootstrapping method is a nonparametric approach to effect-size estimation and hypothesis testing [74].

2.4.1. Performing cross-cultural measurement invariances (testing the measurement model)

A single-group confirmatory factor analysis (SG CFA) and multigroup confirmatory factor analysis (MG CFA) was performed to examine cross-cultural measurement invariance. Measurement-invariance testing ensured that the constructs measured had the same meaning across the three country groups. This involves the comparisons of series of measurement models with gradual restrictive constraints between the three groups. Cheung and Rensvold's [15] rule of comparative fit index – difference ($\Delta CFI \geq .01$) was used to examine a significant increase between a pair of comparisons between two nested model specifications. Finding improvement in CFI of .01 or more when freeing a parameter across multiple groups indicates that the parameter value is different across the groups tested.

Two levels of invariance testing were performed [109]. First, the *configural invariance* was tested to see if the participants from the three country groups conceptualized the subscale constructs similarly. Second, *metric invariance* was performed to check if each item contributed to the latent factor in a roughly equivalent way across all three countries. The present study did not compare means of scale scores across Canadian, Icelandic, and Thai samples. Therefore, it did not test for invariance of means of scale score (scalar invariance).

2.4.2. Hypotheses testing: Moderation and mediation analysis (testing the structural model)

Moderation analysis (hypotheses 1-2). The main analysis was multi-group structural equation modeling (MG SEM) which tested whether the direct and indirect pathways in the hypothesized structural model were moderated by eco-social context. The aim of the moderation was to specify if the eco-social context in the three countries increases or decreases the strength

of the effect of cultural values on pain-related caregiver behaviors. Specifically, we tested if an individualistic eco-social context (i.e., Canada and Iceland) creates a horizontal/vertical individualism-authoritative-solicitous pathway, and if a collectivistic eco-social context (i.e., Thailand) would create a collectivism-authoritarian-discouraging pathway. The results of this analysis determined if single or multi-group SEM would be used to test whether parenting styles mediated the effects of cultural values on pain-related caregivers' behaviors.

Mediation analysis (hypotheses 3-10). The aim of the mediation was to specify how the predictor variables (vertical individualism, horizontal individualism, and collectivist values) affected outcome variables (solicitous and discouraging behavior) through mediators (authoritative- and authoritarian-parenting style). Specifically, we tested if horizontal/vertical individualism would have a positive effect on solicitousness, through authoritative-parenting style. We also tested if collectivism would have a positive effect on discouraging, through authoritarian-parenting style.

When describing mediation pathways in the structural model, the terms a , b , c , and c' paths were used, to align with the nomenclature used by Baron and Kenny [2]. The a -paths represent the effect of the predictor variables (cultural values) on the mediator variables (parenting styles) (i.e., Hypotheses 3-4). The b -paths represent the effect of the mediator (parenting styles) variables on the outcome variables (pain-related parental behaviors) (i.e., Hypotheses 5-6). The c' -paths (often called direct effects) represent any remaining link between predictor and outcome, after controlling for mediators. The c -paths (often called total effects) represent the total effect of predictor on outcome, before adding the mediating variables into the model (i.e., Hypotheses 7-8). The ab paths represent the indirect effect of the predictor on the outcome, through mediator variables (i.e., Hypotheses 9-10). The ab paths are calculated by

multiplying the a-path and b-path together, and are mathematically equivalent to the difference of the c and c' paths (c-c'; [74]). The mediation analysis was based on Preacher and Hayes's [74] framework, where the total effect (path c) does not need to be significant, as the focus is on the size of the indirect effect, and mediation is only said to occur as long as the indirect effect is statistically significant. Statistical significance of the indirect effect was calculated using bias-corrected bootstrapping with 5,000 resamples [74]. The ratio of indirect to total effect (percent mediation, P_M) was calculated to assess the effect size of the indirect effect, using the formula $P_M = ab/ab + c'$ [61; 74; 75].

2.4.3. Testing covariate effect

The final part of the MG SEM involved the controlling for potential confounding variables in the final structural model. The covariates were of secondary concern, and thus included at the later stages of the model-building process. Covariates were selected based on their theoretically meaningful potential influence on the modeled relationships. Given that SEM is a theory-driven method (and to reduce model complexity given the sample size), only one covariate was added at a time. The covariates were added to see if the effects would change, once any potential covariate's influence was controlled [56].

3. Results

3.1. Demographic background of samples

The characteristics of the three country groups are provided in Table 3. For the analysis, female participants who identified as the mother, stepmother, or female legal guardian of the target child were categorized as mothers. Similarly, male participants who identified as the father, stepfather, or male legal guardian were categorized as fathers. A Chi-square test showed that more caregivers, or 425 (80%) of participants, were mothers than fathers, $\chi^2(2) = 26.982, p$

< .0001. Compared to the Canadian and Icelandic participants, more Thais used the “Other” category (i.e., not “mother” or “father”) to describe their relationship with the child (see Table 3). In the Thai “Other” category ($n = 31$), a majority (65%) were grandmothers. Overall, most caregivers were married (82.4%), and the pattern for marital status did not differ by country (see Table 3). Caregivers’ age was collected as a numeric value, and ranged from 22 to 67 years, and was significantly different between groups (see Table 3). A Tukey *post hoc* test revealed that Thai caregivers were significantly older than Canadian ($p < .001$) and Icelandic ($p < .001$) caregivers. A chi-square test showed significant group differences on maximum family education levels (see Table 3), with Thais reporting lower educational levels than Canadians ($p < .0001$), and Icelanders ($p < .0001$). Most Canadian and Icelandic families had postsecondary education, whereas Thai families tended to have trade school or community college education levels. Although the undergraduate degree was the most frequently reported education level in all countries (i.e., Canada, 35%; Iceland, 39%; and Thailand, 24%), the Thai sample had a much higher proportion with primary education only.

Please insert TABLE 3 here

Children’s ages ranged from 6 to 12 years and were relatively similar across groups. Significant differences between groups (see Table 3) on children’s age emerged with Canadian children being significantly younger than those in Iceland ($p < .01$) and Thailand ($p < .01$). While the age difference was relatively small and all children were within the expected age range, age was used as a potential covariate in the main analysis. The proportion of boys and girls did not

differ significantly across the three samples. No significant differences arose between countries on chronic illness (see Table 3). However, significant differences emerged between countries on experience of hospitalization (see Table 3), with Thais reporting a rate over 57%, compared to Canadians with around 23%, and Icelanders with around 27%. A variable was created¹ that combined chronic illness with hospitalization in each country, the analysis of which showed no significant differences ($\chi^2(2) = 1.210, p < .546$). When all caregivers were asked if the child had missed school due to pain in the last 3 months, 30% answered yes. There was no significant difference found between the groups on days missed at school due to pain (see Table 3). Figure 2 shows the prevalence of recurrent pain in the past 3 months, by the type of pain. Overall, stomach pain was the most common type of recurrent pain in Canada (16.9%) and Iceland (15.4%), whereas in Thailand, “other pain” (5.9%) was most frequently reported and included: “toothache,” “sore throat,” “eye pain,” “allergy,” “fever,” and “menstruation.” Furthermore, chi-square analysis indicated group differences for stomach ache ($\chi^2(2) = 17.670, p < .0001$), and headache ($\chi^2(2) = 13.458, p < .001$), and in both instances Thai caregivers reported significantly lower frequencies compared to those in the other countries (stomachache: Thailand vs. Canada [$p < .0001$]; Thailand vs. Iceland [$p < .0001$]; headache: Thailand vs. Canada [$p < .0001$], and; Thailand vs. Iceland [$p < .0001$] (see Figure 2).

Please note that the mean score, standard deviations, and correlation coefficients for all measures (horizontal individualism, vertical individualism, collectivism, authoritative-parenting style, authoritarian-parenting style, solicitousness and discouraging) for each sample can be found in a supplementary Table.

3.2. Cross-cultural measurement invariance of the measurement model

¹ This was a binary variable, looking only at the chronically ill children, and was coded: ‘0’=not hospitalized but had a chronic illness and ‘1’ = hospitalized and had a chronic illness.

First, SG-CFA was used to define the seven-factor measurement model in each of the three counties separately. Results from goodness-of-fit absolute indices (i.e., RMSEA \leq .06 and SRMR \leq .08) showed that the proposed factor structure was adequate in each country (Table 4). Next, MG-SEM was used to test the cross-cultural invariance of the seven-factor measurement model. The goodness-of-fit indices for the configural-invariance model and the metric-invariance yielded adequate fit to the data as their CFI and TLI values were $>$.9. Finally, when the change in CFI (comparative fit indices) between the configural and metric models was tested, showing the Δ CFI \Rightarrow .950 (CFI_{configural}) - .943 (CFI_{metric}) = .007, which, based on Cheung and Rensvold's rule (i.e., a change $<$.01 is non-significant) [15] indicated that the two models were not significantly different. Based on these results the seven-factor measurement model shows metric-invariance across the three country samples (Table 4). This multigroup, metric invariance model was incorporated for the latent variables at all subsequent steps.

Please insert TABLE 4 here

3.3. Testing the hypothesized structural model

Figure 3 shows the results for the final seven factor structural model. Unstandardized, rather than standardized, regression coefficients were used, as they are preferred when comparing results for the same predictors across different samples [50]. Here the relationship between cultural values (vertical individualism, horizontal individualism, and collectivism) and pain-related behaviors (solicitousness, and discouraging) is mediated by parenting styles (authoritative, and authoritarian). That is, cultural values are associated with caregivers'

parenting style, which in turn are associated with caregiver pain-related behavior. In this way, cultural values have an indirect effect on caregivers' behaviors through parenting styles.

3.3.1. Cross-cultural comparisons of hypothesized structural model (testing hypotheses 1-2)

MG SEM was used to test if the magnitude of the paths, depicted in Figures 3, differed across countries. The goodness-of-fit indices for the freely estimated structural model, and the structural model with paths (but not covariances) constrained to equality, appear in Table 4. The goodness-of-fit indices for a structural model with all paths and covariances allowed to freely vary across countries showed adequate fit: $\chi^2(532) = 789.658, p = .0001, CFI = .94, TLI = .93, RMSEA = .05, \text{ and } SRMR = .06$. When all paths were constrained to equality across countries, the model continued to demonstrate adequate fit: $\chi^2(564) = 835.740, p = .0001, CFI = .94, TLI = .93, RMSEA = .05, \text{ and } SRMR = .08$. In comparing the fit statistics for these two models, the outcomes were very similar. The change in CFI was small ($\Delta CFI = .003$), suggesting that the more parsimonious model (i.e., paths constrained to equality) should be preferred [15]. These results indicated that country did not change the relationships between the predictor, mediator and outcome variables in the model. Therefore, moderation did not occur. This meant that all future analysis would use a multigroup model, with factor loadings and regression paths constrained to equality across countries, not single-group structural equation modeling.

3.3.2. Relation between cultural values, and parenting styles (testing hypotheses 3 and 4)

Table 5 and Figure 3 show the relationships between cultural values and parenting styles.

Please insert TABLE 5 here

Authoritative-parenting style was negatively associated with vertical individualism and positively associated with both horizontal individualism and collectivism, while controlling for all other predictor variables. Of these three relationships, collectivism emerged as the strongest predictor, and collectively, these variables predicted between 17% and 23% of the variance in authoritative parenting. However, of these effects, only the positive relationship between horizontal individualism and authoritative-parenting style was hypothesized a-priori.

Authoritarian-parenting style was positively associated with vertical individualism, and unrelated to horizontal individualism and collectivism. Collectively, these variables predicted between 9% and 13% of the variance in authoritarian-parenting. That is, participants high on vertical individualism were likely to report using an authoritarian-parenting style.

3.3.3. Relation between parenting styles and outcomes (testing hypotheses 5 and 6)

Both authoritative-parenting style and authoritarian-parenting style positively predicted solicitousness. That is, as both of these parenting styles increased, solicitousness also increased. That means parents who used an authoritarian-parenting style were also likely to use solicitousness. However, the largest relationship was observed for authoritative-parenting. Collectively, all variables explained between 11% and 33% of the variance in solicitousness. In contrast, only authoritarian-parenting style predicted discouraging; authoritative-parenting style had a near-zero, nonsignificant relationship with discouraging. Collectively, all variables predicted between 26% and 31% of the variance in discouraging. See Figure 3 and Table 5.

3.3.4. Direct and total effects on solicitousness and discouraging (testing hypotheses 7 and 8)

There were no statistically significant total or direct effects of cultural values (i.e., vertical individualism, horizontal individualism, or collectivism) on solicitousness. So, these variables were generally unrelated to the solicitousness. However, given the significant a-paths

and b-paths observed in the data, mediation might still occur. This is known as “inconsistent mediation”, and usually occurs because the mediator is acting as a suppressor variable [61]. In contrast, there was a positive total effect for vertical individualism on discouragement. Moreover, there was a significant positive direct effect for vertical individualism on discouragement, and a significant negative direct effect for collectivism on discouragement. In general then, the VI → Authoritarian → Discouragement mediation path appears to be the strongest candidate for traditional mediation. See Figure 3 and Table 5.

3.3.5. Indirect effects on solicitousness (testing hypothesis 9)

Table 5 shows the four specific significant mediations for the effect of cultural values on solicitousness through parenting styles that emerged. Results showed that participants’ score on vertical individualism had a significant negative indirect effect on their scores for solicitousness through their scores on authoritative-parenting style (95% CI [0.062, -0.015]). That is, increased vertical individualism was associated with a decrease in authoritative parenting, which in turn was associated with a decrease in solicitousness. The relationship between vertical individualism and authoritative-parenting style accounts for 51% of the negative relationship between vertical individualism and solicitousness. That is, about 51% of vertical individualism’s negative effects on solicitousness was due to its negative relation with the authoritative-parenting style (which, in turn, positively related to solicitousness).

Results showed that participants’ scores on vertical individualism had a significant positive indirect effect on solicitousness through the authoritarian-parenting style (95% CI [0.003, 0.036]). That is, increases in vertical individualism was associated with an increase in authoritarian parenting, which in turn was associated with an increase in solicitousness. The relationship between vertical individualism and authoritarian-parenting style accounts for 32% of

the relationship between vertical individualism and solicitousness. Moreover, 32% of vertical individualism's positive effect on solicitousness was due to its positive effects on authoritarian-parenting style.

Results showed that participants' scores on horizontal individualism had a significant indirect effect on solicitousness through the authoritative-parenting style (95% CI [0.008, 0.084]). That is, horizontal individualism was associated with an increase in authoritative-parenting, which in turn was associated with an increase in solicitousness. The relationship between horizontal individualism and authoritative-parenting style accounts for 78% of the relationship between horizontal individualism and solicitousness. Moreover, 78% of horizontal individualism's positive effect on solicitousness was due to its positive effect on authoritative-parenting style.

Collectivism also indirectly predicted solicitousness through authoritative parenting (95% CI [0.039, 0.138]), with the authoritative-parenting style accounting for 61% of the total effect of collectivism on solicitousness. The relationship between collectivism and authoritative-parenting style accounts for 61% of the relationship between collectivism and solicitousness.

3.3.6. Indirect effects on discouraging (testing hypothesis 10)

Table 5 shows the six indirect paths to discouraging. Of these, one specific significant mediation for the effect of cultural values on discouraging through parenting styles, emerged. Results showed that vertical individualism had a significant indirect effect on discouraging through the authoritarian-parenting style (95% CI [0.015, 0.055]). That is, vertical individualism was associated with an increase in authoritarian parenting, which resulted in an increase in discouraging behavior. The relationship between vertical individualism and authoritarian-parenting style accounts for 41% of the relationship between vertical individualism and

discouraging. In other words, vertical individualism had an indirect effect on discouraging through the authoritarian-parenting style, but the authoritarian-parenting style accounted for 41% of the total effect of vertical individualism on discouraging.

3.3.7. *Controlling for child sex, child age, and family education*

Covariates were entered one at a time, at later stages of the MG SEM, to ensure they did not impact the primary results [56]. The goodness-of-fit indices for the structural model with paths and covariances constrained to equality for child sex, child age and family max education separately, appear in Table 4. Results show that for all three models, three of the four goodness-of-fit indices showed adequate fit; only the SRMSR index suggested poorer fit. Importantly, the analysis also revealed the same pattern of results described earlier, even when adding these covariates, indicating that the results hold when controlling for child age, child sex, and family education. However, when each individual covariate was explored and each individual variable in the model, some important results emerged.

Child age. Child age negatively and significantly linked with authoritarian-parenting style ($B = -.029$, $SE = .009$, $p = .001$), indicating that as children got older, parents tended to be less authoritarian. Further, for the Icelandic sample only, child age strongly-to-moderately and negatively correlated with vertical individualism ($B = -.504$, $SE = .224$, $p = .024$), indicating that as children got older, parents reported less vertical individualism; however, given the number of tests conducted, the p-value (which is close to the .05 cut-off), the large standard error, and the lack of a priori theory predicting these results, it is probable that this finding is spurious. In Canada and Thailand, the correlation between child age and vertical individualism was weak and nonsignificant ($B = -.039$, $SE = .221$, $p = .859$; $B = .03$, $SE = .265$, $p = .911$, respectively).

Child sex. Child sex was not found to be an important covariate, as it did not significantly predict any exogenous or endogenous variables.

Family education. After controlling for other variables in the model, a negative and significant relationship emerged with solicitous pain-related parent responses ($B = -.037$, $SE = .016$, $p = .018$), indicating that parents with higher education tended to be less solicitous. Again, this exploratory relationship should be treated cautiously, given the number of tests conducted. Further, for the Canadian sample only, family education moderately and positively correlated with vertical individualism ($B = .410$, $SE = .146$, $p = .005$), but this relationship was nonsignificant in the Icelandic sample ($B = -.043$, $SE = .175$, $p = .805$) and the Thai sample ($B = -.369$, $SE = .250$, $p = .141$). For the Icelandic sample, however, family education strongly and positively correlated with horizontal individualism ($B = .536$, $SE = .183$, $p = .003$), but was nonsignificant in the Canadian and the Thai samples ($B = .107$, $SE = .111$, $p = .332$; $B = .108$, $SE = .263$, $p = .681$, respectively).

4. Discussion

To our knowledge, this was the first study to examine the association between eco-social context, cultural values, parenting styles, and pain-related parental responses, ~~and~~ by using samples from three countries. Two key findings, summarized in Figure 4, can be extracted from this study. Firstly, the eco-social context does not moderate the association between cultural values, parenting styles, and pain-related parental behaviors. This is contrary to ecological theories. Maybe the study sites were too similar, as all were in small cities. Yet another explanation consistent with universal theories [7; 18; 76; 83; 101], is that this developmental process may be universal in the sense that these behaviors are commonly found in individuals,

independent of their eco-social context, and that these processes rest on general principles, rather than the specific individual attributes studied.

Secondly, consistent with cultural models of parenting theories [25; 45; 47], a complex relationship exists between cultural values, parenting styles, and pain-related parental behaviors. The present study showed that parenting style consistently mediated the relationship between the cultural values and pain-related behaviors adopted by parents. Overall, these findings suggest that, in a pain context, parents oriented towards collectivism (e.g., emphasize sharing, helping, sacrificing) and horizontal individualism (e.g., emphasize equality, fairness, and similarity) are likely to adopt authoritative-parenting style and in turn, use solicitousness pain-related response, but not discouraging. On the other hand, parents oriented towards vertical individualism (e.g., emphasize hierarchy, and self-reliance) are likely to adopt authoritarian parenting style and in turn, likely use discouraging pain-related parental behavior, but also solicitousness. Furthermore, when controlling for child sex, age, and family education, overall results did not change. To fully understand the results, one must first understand the pieces contributing to the overall findings.

4.1. Parents' cultural values and parenting styles

Within the structural model, it was identified that parents who oriented towards *horizontal individualism* adopted *authoritative-parenting styles*, ~~and~~ which is consistent with findings of others [97]; showing that when a parents place a value on egalitarian communication and individual needs, it is reflected in their support of child's individuality, and needs for emotional self-expression [3; 27; 71]. The findings of direct relationship between *collectivism* and *authoritative-parenting* contradicts some [85; 115], but align with others [73; 88; 97]; pointing to what others have suggested which is that collectivistic cultures do encourage "other-focused" emotions (e.g., empathy), while discouraging "self-focused" emotions (e.g., anger) [54;

62]. In fact, cross-cultural neuroscientists have shown that a collectivistic mindset, but not a individualistic one, increases activation of brain areas responsible for “other-oriented” responses to pain, like empathy [16; 112]. The direct relationship found between *vertical-individualism* and *authoritarian-parenting style* aligns with some findings [23; 48], but contradict others [84; 97]. At first glance, vertical individualism and authoritarian-parenting style may seem incompatible. Both however facilitate hierarchical communication, power imbalance, and submission to authority [12; 23; 48; 92].

These findings indicate that our conventional way of viewing the relationship between cultural values and parenting styles may not hold. This may be especially true when cultural values are operationalized as multidimensional, as it adds two additional dimensions, horizontal and vertical, that are generally overlooked.

4.2. Parents’ parenting styles and pain-related parental behaviors

The structural model revealed a strong significant relationship between parenting styles and pain-related parental behaviors, suggesting that parenting styles are a powerful mode of pain socialization of parents. The strongest relation emerged between *authoritative-parenting style* and *solicitousness*, and between *authoritarian-parenting* and *discouraging*. These results are consistent with the findings of others [10; 37]. The results also showed a direct, but less strong, link between *authoritarian-parenting style* and *solicitousness*. Parenting styles are conveyed through parents’ body language, and tone of voice [21]. As such, these results may link to what others have reported, which is that *solicitousness* can be delivered with hostility [67]. These results also suggest that *solicitousness* may be an inherent pain-related parental response, which is addressed later.

4.3. Parents’ cultural values, parenting styles, and pain-related parental behaviors

We posited on the basis of theory [25; 45] that cultural values affect pain-related parental behaviors, through mechanisms of parenting styles. Parenting styles were shown to mediate the relationship between parents' cultural value orientation and pain-related parental behaviors. These results align with the sociocommunications model of children's pain [78], which suggest that cultural elements assert their influences indirectly through caregivers, providing caregivers with schemas for culturally appropriate behavior.

Most of the indirect relationships found were unexpected (see Figure 4). Both authoritative- and authoritarian-parenting styles were positive mediators for solicitousness, and all three cultural values, including collectivism, indirectly influenced solicitousness. While most of these cultural models of parenting were unexpected, the literature also suggests that around the same developmental task there are "infinite combinations along these dimensions" (p. 33)[45]. What these models seem to provide is variance in the way solicitousness can be expressed. More specifically, it is possible that: (a) when horizontal individualism and an authoritative-parenting style facilitates solicitousness, it may occur in a child-centered atmosphere where the child is encouraged to express pain openly and freely, facilitating self-expression, individuality, and self-efficacy, which are all important characteristics of individualism; (b) when vertical individualism and an authoritarian-parenting style facilitate solicitousness, the atmosphere might be self-oriented and less child friendly, perhaps serving as a way for the parent to vent and express personal distress concerning the child's pain, and; (c) when collectivism and an authoritative-parenting style facilitate solicitousness, the atmosphere is other-oriented. Parents show empathy and an understanding toward their child's needs and feel obliged to help their child. These are all speculations built on theory, but consistent with current results.

Another unexpected relationship was that authoritarian-parenting style mediated discouraging through vertical individualism, but not collectivism. According to Goubert et al. [24] parental pain-related discouraging behavior may be aimed at reducing the parent's own distress, rather than the child's. This possibility aligns with the suggestion that self-focusing and self-serving bias are characteristic for individuals that are high on vertical individualism [16; 106]. This notion aligns also with authoritarian parenting, which is generally described as demanding unrealistic maturity and responsibility from the child [8]. Another explanation for the results reported may relate to the self-reliance component of vertical individualism [106], as individualistic parents may strongly value self-reliance and emotional independence [43; 102; 113]. Thus, discouraging behavior may also be the parent's approach to teach the child self-reliance when in pain.

4.4. Study limitations

The findings must be interpreted in the context of several limitations. A cross-sectional survey design and a convenience sample were used, providing parents' self-reports of interactions with children. This limits the generalizability of the findings to the general population as well as making conclusions of directions of relationships. Sampling was also limited to one delineated geographical region in each of the three countries. Therefore, conclusions are limited to the sample, variables, and time frame presented by the design. Future studies should weigh the benefits and challenges of incorporating random samples into the design. In this study, the horizontal-vertical collectivistic subscales were problematic. The internal consistency of the vertical collectivism subscale was low (Canadian and Icelandic samples only), the correlation between the horizontal and vertical collectivism subscales was high (Thai sample only), and factor analysis showed the vertical collectivistic items loaded

highly on the horizontal collectivism subscale (Thai sample only). These issues indicated a conceptual overlap among the vertical/horizontal collectivism subscales. Similar to others [71], this issue was addressed by combining the two collectivism subscales. Future studies should consider using other measurements for individualism and collectivism.

4.5. Conclusions

This study suggests that parental behaviors around pain are informed by cultural models of parenting. The developmental literature suggests that some universal parenting behaviors exist. For example, adults' baby talk seems to be triggered by the presence of a baby. This behavior appears in virtually all investigated cultures, assumed to exist without explicit learning [7; 46]. Likewise, pediatric pain researchers described reassurance (one form of solicitousness) as being an "instinctive" [36], "naturalistic" [55], and "ingrained" [65] way parents help their children in acute pain situations. Hence, solicitousness seems to be a universal attempt by parents to limit suffering and promote wellbeing in their children, which may convey an evolutionary advantage. While solicitousness may be an "ingrained" behavior, and independent of eco-social contexts, this behavior seems to be expressed differently depending on the cultural values and parenting styles promoting it. Also, the vertical individualism-authoritarian cultural model process suggests that solicitousness and discouraging behaviors do not necessarily preclude each other, as previously assumed. It is therefore possible that, in a clinical setting, caregivers respond to their child's pain with solicitousness and discouraging in conjunction.

The findings from this study have implications for theory development about culture and pediatric pain. They support the sociocommunication model of children's pain by showing that cultural context does affect parents' behaviors. Furthermore, they add to this literature by specifying *what* cultural factors, and *how* these factors, influence pain-related parental behaviors.

This study does not provide specific clinical recommendations. Culture has a complex relationship to pain and simplistic notions of the effect of culture on pediatric pain are not supported by the evidence.

Conflict of interest statement

The authors have no conflict of interest to disclose.

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Table 1. Describing hypothesized relationships shown in Figure 1

Hypothesized relationships	References
<i>Westernized vs. non-westernized eco-social contexts</i>	
H1: Relationship between individualistic values and authoritative-parenting style larger in westernized contexts relative to non-westernized contexts	[25-27; 45; 47]
H2: Relationship between collectivistic values and authoritarian-parenting style larger in non-westernized contexts relative to westernized contexts.	[25-27; 45; 47]
<i>Parents' cultural values and parenting styles</i>	
H3: Positive relation between individualistic values and authoritative-parenting style	[26-28; 59; 97]
H4: Positive relation between collectivistic values and authoritarian-parenting style	[23; 27; 59; 97]
<i>Parents' parenting styles and pain-related parent behaviors</i>	
H5: Positive relation between authoritative-parenting style and solicitousness (emotion encouraging behavior)	[9; 27; 37; 47]
H6: Positive relation between authoritarian-parenting style and discouraging (emotion dismissing behavior)	[27; 37; 47]
<i>Parents' cultural values and pain-related parent behaviors</i>	
H7: Positive relation between individualistic values and solicitousness (emotion encouraging behavior)	[27; 68; 111]
H8: Positive relation between collectivistic values and discouraging (emotion dismissing behavior)	[27; 44]
<i>Parents' cultural values, parenting styles, and pain-related parent behaviors</i>	
H9: Individualistic values indirectly effect solicitousness (emotion encouraging) through authoritative-parenting style	[12]
H10: Collectivistic values indirectly effect discouraging (emotion dismissing) through authoritarian-parenting style	[11; 12]

Note: H=hypothesis

Table 2 INDCOL four dimensions and examples.

Value dimensions	Individualism Value independence and distinction from group	Collectivism Value interdependence and inclusion to group
Vertical Value hierarchy and status in group	Vertical individualism “Winning is everything”	Vertical collectivism “I usually sacrifice my self-interest for the benefit of my group”
Horizontal Value equality and similarity in group	Horizontal individualism “Being a unique individual is important to me”	Horizontal collectivism “My happiness depends very much on the happiness of those around me”

Table 3 Demographic characteristics by country

	Canada		Iceland		Thailand		Group Comparisons χ^2 or F
	<i>n</i>	%	<i>N</i>	%	<i>n</i>	%	
<i>Caregiver type</i>							
Mother	158	86.3	149	80.9	118	65.6	$\chi^2(2) = 70.275,$ $p < .0001$
Father	25	13.7	35	19.0	31	17.7	
Other	0	0	0	0	31	17.2	
<i>Caregiver age</i>	$M = 39.68$ $SD = 5.61$		$M = 39.81$ $SD = 6.6$		$M = 42.67$ $SD = 9.73$		$F(2,546) = 9.138,$ $p < .0001$
<i>Caregiver married</i>	156	85.3	151	82.1	143	79.9	$\chi^2(2) = 3.526,$ $p = .47$
<i>Family max education</i>							
Less than 7th grade	0	0	0	0	2	1.1	$\chi^2(2) = 94.552,$ $p < .0001$
Junior high graduate	0	0	3	1.6	27	15.0	
Some high school	3	1.6	5	2.7	22	12.2	
High school graduate	5	2.7	28	15.2	29	16.1	
Trade	33	18.0	2	1.1	32	17.8	
school/community college							
Partial university	31	16.9	14	7.6	7	3.9	
University degree	64	35.0	71	38.6	43	23.9	
Graduate	47	25.7	61	33.2	18	10.0	
school/professional training							
<i>Child age</i>	$M = 8.62$ $SD = 1.86$		$M = 9.25$ $SD = 1.95$		$M = 9.29$ $SD = 2.1$		$F(2,546) = 6.586,$ $p < .001$
<i>Child sex (female)</i>	80	43.7	89	48.9	94	52.2	$\chi^2(2) = 2.64,$ $p = .27$
<i>Child chronic illness (yes)</i>	18	9.8	17	9.2	23	12.8	$\chi^2(2) = 1.37,$ $p = .50$
<i>Child hospitalization (yes)</i>	43	23.5	50	27.2	103	57.2	$\chi^2(2) = 53.927,$ $p < .0005$
<i>Child days missed school due to pain</i>							
0 times	119	65.0	132	71.7	129	71.7	$\chi^2(6) = 10.89,$ $p = .09$
1–3 times	54	29.5	46	25.0	50	27.8	
4–6 times	8	4.4	5	2.7	0	0	
7 times or more	2	1.1	1	0.5	0	0	

Note. Canada $n = 183$. Iceland $n = 184$. Thailand $n = 180$. All Data $N = 547$. Group comparisons compare reported values across the three countries (Chi-squares of independence for categorical variables One-way ANOVA for numerical variables).

Table 4 Fit indices for multigroup measurement and structural models.

Model tested	X^2	df	TLI	RMSEA	SRMR	CFI	ΔCFI
<i>Measurement models</i>							
Configural-invariance model	727.700	505	.938**	.049	.056	.950	—
Metric-invariance model	789.658	532	.932**	.052	.065	.943	.007
<i>Structural models</i>							
Freely estimated structural model	789.658	532	.932***	.052	.065	.943	—
Constrained paths structural model	835.740	564	.932***	.051	.076	.940	.003
<i>Covariates added to the constrained paths structural model</i>							
Controlling for child sex	961.174	617	.915***	.055	.088	.924	—
Controlling for child age	977.031	617	.911***	.057	.089	.921	—
Controlling for family max education	998.760	617	.906***	.058	.089	.917	—

* $p < .05$, ** $p < .01$, *** $p < .001$.

Table 5 Direct and indirect effects.

Predictor	Mediator	Outcome	<i>a</i> path	<i>b</i> path	<i>c'</i> path (direct effect)	<i>c</i> path (total effect)	95% CI <i>ab</i> (indirect effect)	P_M
VI	Authoritative	Sollicitous	-0.075***	0.476***	-0.034	-0.072	[-0.062, -0.015]*	.51
VI	Authoritarian	Sollicitous	0.067***	0.189*	-0.034	-0.020	[0.003, 0.036]*	.32
HI	Authoritative	Sollicitous	0.067*	0.476***	-0.010	0.025	[0.008, 0.084]*	.78
HI	Authoritarian	Sollicitous	0.019	0.189*	-0.010	-0.008	[-0.007, 0.018]	—
Collectivism	Authoritative	Sollicitous	0.182***	0.476***	0.053	0.138	[0.039, 0.138]*	.61
Collectivism	Authoritarian	Sollicitous	0.025	0.189*	0.053	0.060	[-0.004, 0.026]	—
VI	Authoritative	Discourage	-0.075***	-0.000	0.047**	0.048	[-0.005, 0.010]	—
VI	Authoritarian	Discourage	0.067***	0.417***	0.047**	0.078***	[0.015, 0.055]*	.41
HI	Authoritative	Discourage	0.067*	-0.000	0.021	0.020	[-0.012, 0.005]	—
HI	Authoritarian	Discourage	0.019	0.417***	0.021	0.028	[-0.015, 0.027]	—
Collectivism	Authoritative	Discourage	0.182***	-0.000	-0.077**	-0.075	[-0.023, 0.013]	—
Collectivism	Authoritarian	Discourage	0.025	0.417***	-0.077**	-0.059	[-0.011, 0.038]	—

Note. VI = vertical individualism, HI = horizontal individualism, C = collectivism, P_M = The effect size of the indirect effect was calculated by taking a ratio of the indirect effect to the direct effect, $ab/(ab + c')$ [16]. * $p < .05$, ** $p < .01$, *** $p < .001$.

Supplementary Table

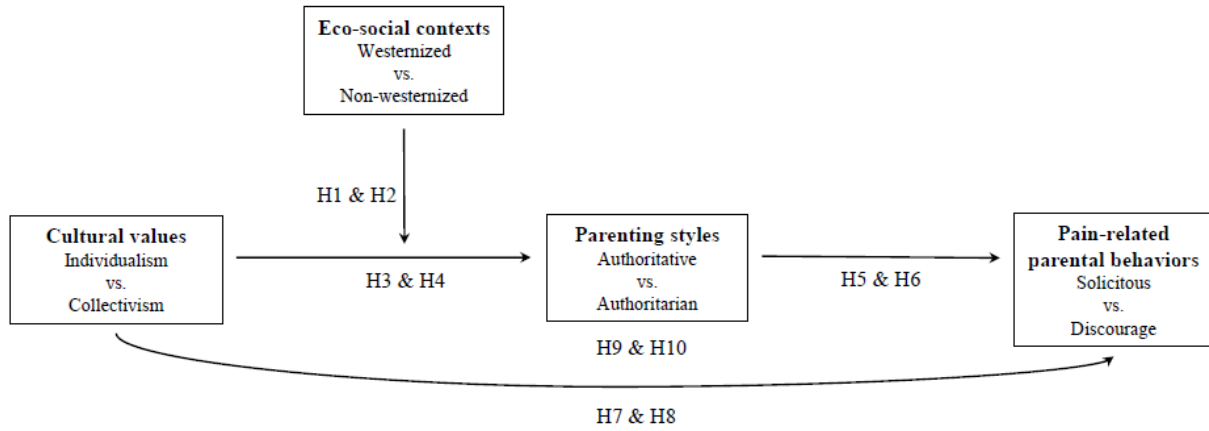
Bivariate correlations and descriptive statistics of main measurements

		1	2	3	4	5	6	Mean	SD
Canada	1. Vertical Individualism							3.49	1.45
	2. Horizontal Individualism	.355**						6.75	1.07
	3. Collectivism	-.003	.192*					7.22	0.81
	4. Authoritative	-.164*	.093	.314**				4.24	0.45
	5. Authoritarian	.212**	.121	.056	-.428**			1.55	0.39
	6. Solicitous	-.126	-.016	.292**	.373**	.061		3.17	0.72
	7. Discourage	.255**	.143	-.140	-.253**	.271**	-.215**	1.56	0.50
Iceland	1. Vertical Individualism							4.41	1.44
	2. Horizontal Individualism	.292**						6.26	1.17
	3. Collectivism	.068	.210*					7.01	0.97
	4. Authoritative	-.120	.205*	.209*				4.21	0.44
	5. Authoritarian	.259**	.153	.121	-.376**			1.68	0.38
	6. Solicitous	.028	.143	.257**	.307**	.035		3.33	0.71
	7. Discourage	.149	.027	-.112	-.291**	.353**	-.252**	2.03	0.51
Thailand	1. Vertical Individualism							4.26	1.50
	2. Horizontal Individualism	.437**						6.08	1.55
	3. Collectivism	.201*	.492**					7.43	1.30
	4. Authoritative	.098	.291**	.594**				3.90	0.71
	5. Authoritarian	.163	.331**	.254**	.267**			2.26	0.53
	6. Solicitous	.030	.122	.228**	.380**	.062		3.54	0.71
	7. Discourage	.330**	.064	-.099	-.090	.252**	.282**	2.20	0.65

Note. Listwise deletion was used within each country: Canada (N = 167), Iceland (N = 134), Thailand (N = 135).

* $p < .05$, ** $p < .01$

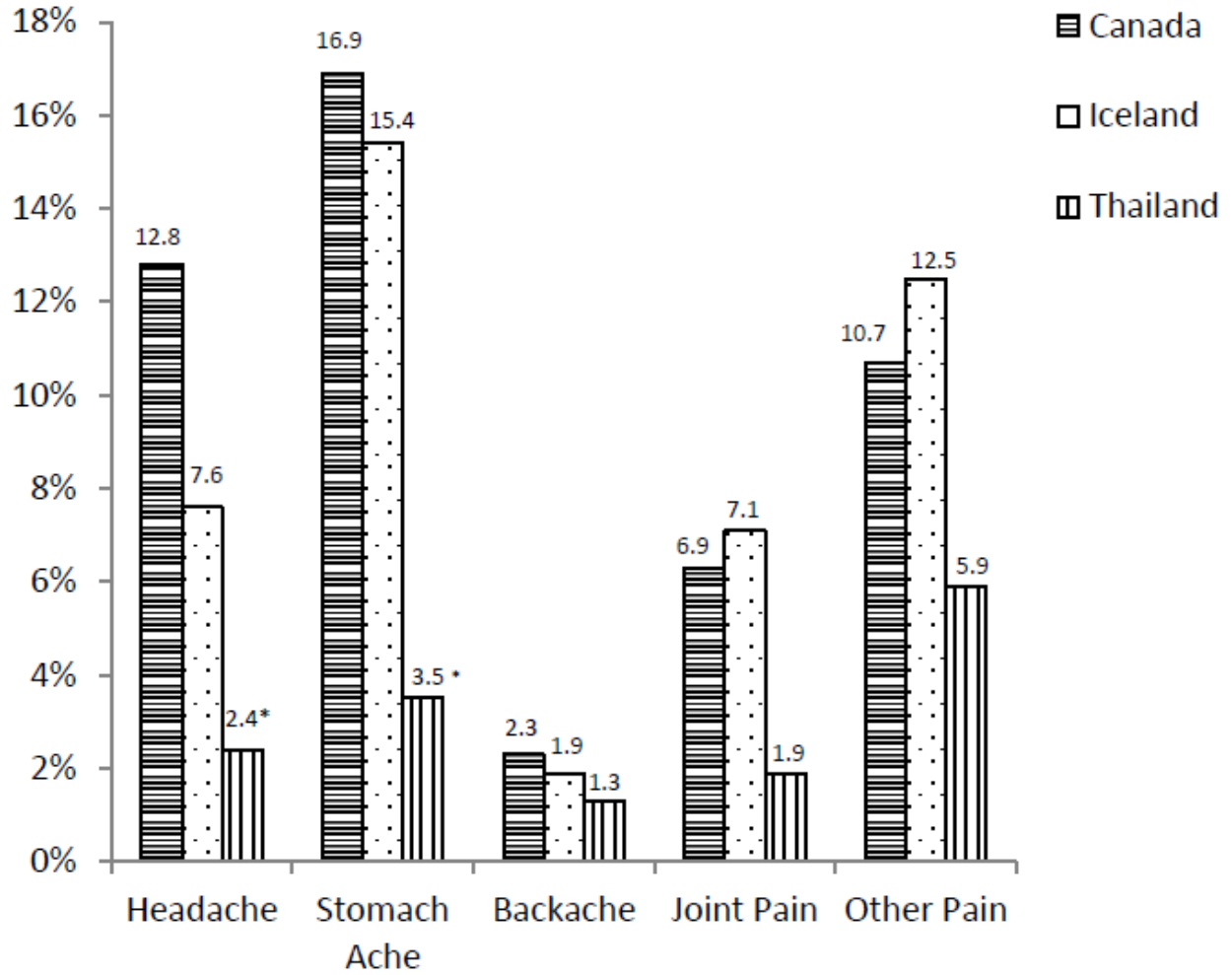
Figure 1
Conceptual model.



Note: H=hypothesis

Figure 2

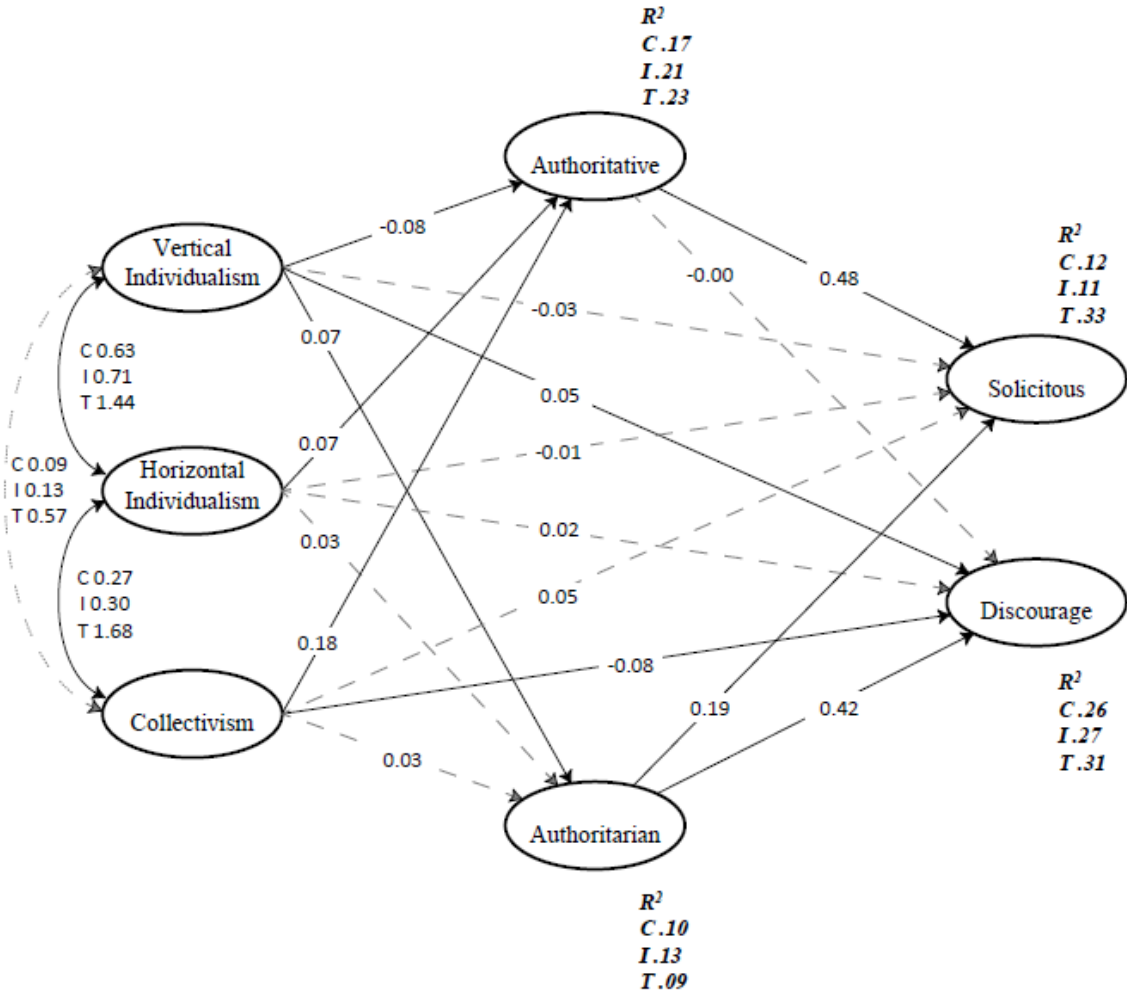
Percent caregiver reported weekly and more frequent child recurrent pain.



*p < .05.

Figure 3

The final hypothesized structural model.

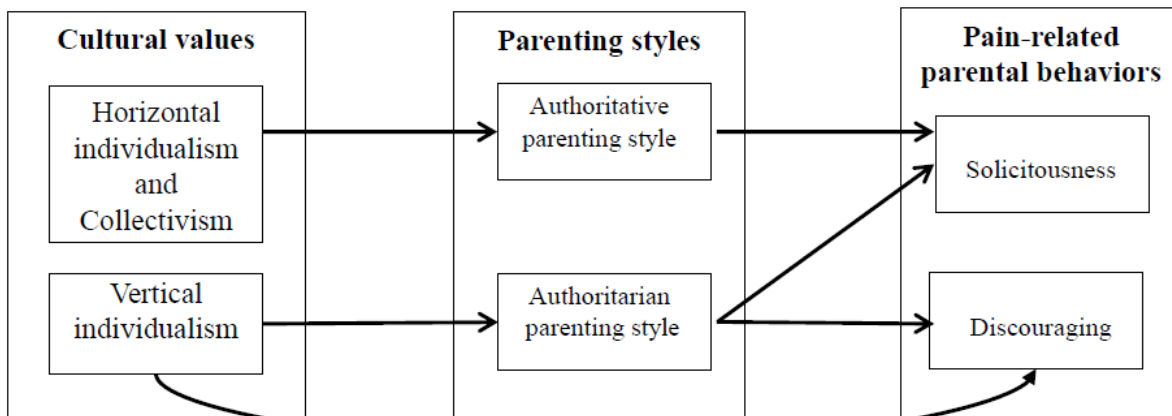


Note: C=Canada, I=Iceland, T=Thailand. Ovals indicate latent variables. Double-headed arrows indicate covariances. Single-headed arrows indicate paths (regression coefficients). Solid black lines indicate statistically significant effects ($p < .05$). Dotted grey lines indicate nonsignificant effects ($p > .05$). Numbers on paths and covariances represent unstandardized coefficients. Though not shown, results are from a multigroup model where factor loadings and regression coefficients were constrained to equality across groups. Covariances were not constrained to equality, so three numbers (one per culture) are reported for covariances. Also, all endogenous variables were allowed to covary (though not shown in this model for clarity). R² values are percent variance values, and are located above endogenous variables. Because variances differ

across cultures, the R^2 values differ across cultures, despite the equality constraint; H3 is represented by the arrows pointing from both individualism variables to authoritative; H4 is represented by the arrow pointing from collectivism variable to authoritarian; H5 is represented by the arrow pointing from authoritative variable to solicitous; H6 is represented by the arrow pointing from authoritarian variable to discourage; H7 is represented by the arrows pointing from both individualism variables to solicitous; H8 is represented by the arrow pointing from collectivism variable to discourage; H9 and H10 are indirect effects calculated from the products of paths for H3-H4 and H5-H6, respectively.

Figure 4

Simplified overview of results.



Note: Horizontal individualism (values independence from group, equality and similarity); vertical individualism (values independence from group, hierarchy and status); collectivism (values interdependence and belonging to group); authoritative parenting style (responsive, bidirectional communication); authoritarian parenting style (power-assertive, unidirectional communication style). Solid black lines indicate statistically significant effects ($p < .05$)

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