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How does caregiver protectiveness change between pain states and across different contexts? A vignette study of expected responses to pain

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ABSTRACT

Greater caregiver protectiveness is often associated with poorer outcomes in children and adolescents with pain. However, there is a lack of understanding about the specific contexts of where protectiveness might be higher or lower, depending on the pain state or activity the child is participating in. This study aimed to disentangle caregiver protectiveness between pain state (acute, chronic, and no pain) and context (sports, schoolwork, chores, social events). We recruited 159 caregivers of children between 12 and 18 years of age via Prolific to an online vignette study. Caregivers were presented with vignettes describing sports, schoolwork, chores, and social events and asked to rate how likely they were to stop their child from participating in the described activity. Caregivers responded to vignettes three times; when considering their child had no pain, acute pain, and chronic pain. They also completed questionnaires on anxiety, depression, catastrophising, and fear of pain. Vignettes describing sports elicited significantly greater caregiver protectiveness compared to chores, schoolwork, or social events. Regarding pain type, while caregiver protectiveness significantly differed between instances of imagined no pain and experienced pain, no significant differences were observed between imagined experiences of acute and chronic pain. Contrary to hypotheses, higher caregiver anxiety was associated with lower caregiver protectiveness. This study provides more context about situations when caregiver protectiveness increases.
Perspective: Caregiver protectiveness is higher for imagined pain vs non-pain contexts but does not differ between acute and chronic pain. Caregivers reported higher protectiveness for vignettes describing sport, followed by chores, social events, and were least protective of children doing schoolwork.

Introduction

Pain is a common experience during childhood. Children experience acute pain from accidents, injury, cosmetic (e.g., ear piercing), and medical procedures, and around 20% report chronic pain.[1] The most prevalent types of chronic pain include musculoskeletal pain, recurrent abdominal pain, and headache.[1] For most children and adolescents, pain is of low impact, but for 5% chronic pain is associated with high impact, disability, distress, and low social participation.[2] Understanding factors that can prevent chronic pain onset is a priority within the field.[3]

A focus of paediatric pain over the last 15 years has been on how caregivers respond to their child with chronic or acute pain and how their behaviour influences child pain experiences, their distress, and behaviour related to pain. The primary focus of caregiver behaviour has been on protective responses towards paediatric chronic pain, to gain a better understanding of associations and predictors of protectiveness and the maintenance of chronic pain. Protectiveness in response to pain is generally perceived as adaptive in acute pain contexts when the child can heal or recover from injury or insult. However, for children with chronic pain, protectiveness is often associated with poorer outcomes.[4,5] For instance, research has found that in children with both acute and chronic pain, higher caregiver protective behaviours are associated with

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higher child somatic symptoms,[4,6] catastrophising[7] and disability.[5] Research has further investigated associations for caregivers and protective behaviours, finding that parent distress, particularly catastrophising is positively associated with higher protective behaviours in children with acute pain,[8] chronic pain,[9] and when tested experimentally.[10,11]

Innovative studies have coded parent-child interactions or assessed parent responses to different pain induction tasks in the laboratory [10,12,13] and in the clinic.[8] However, in surveys, parent protectiveness has been primarily assessed by the Adult Responses to Child Symptoms scale (ARCS).[14,15] The ARCS includes three subscales: protective responses, discouraging or minimising responses, and distracting or monitoring responses, of which, the former has received the most attention. The protect scale asks the caregivers (or children) to report whether they grant special privileges when the child experiences pain, allow the child to avoid activities, or whether the caregiver relieves the child of their duties. However, what is unknown is whether caregivers are only protective for certain types of activities, highlighting the importance of context. For example, caregivers may be protective around physical activity, which carries a higher risk of exacerbating pain compared to sedentary activities.[16]

A better understanding of parenting behaviour across different contexts could be valuable to tailor pain treatments to promote adaptive levels of protectiveness depending on situational characteristics. In this study, we investigated the situational determinants of perceived protective behaviours using a vignette methodology. Our research questions and hypotheses were:

1. Are caregivers more protective of children experiencing acute pain, compared to children experiencing chronic pain or no pain? Given that protectiveness is a beneficial behaviour for children in acute pain compared to chronic pain (where it is associated with poorer outcomes[4,5,17]), we predicted that caregivers would be most protective of imagined acute pain scenarios, followed by chronic pain, and would be least protective of no pain scenarios.
2. Are caregivers more protective of children engaging in sports, compared to chores, schoolwork, or social events? We predicted that caregivers would be most protective of imagined sporting vignettes compared to other activities due to a higher risk of exacerbating pain during physical exercise.[16]
3. Are caregivers who report higher anxiety, depression, pain catastrophizing, and fear of pain more protective of their child doing activities when they have pain? We predicted that caregivers with higher distress would report higher protectiveness for imagined vignettes.[9,10]

Methods

Participants & sampling

Participants were recruited via *Prolific*, an online crowdsourcing platform where researchers can advertise their study to participants based on their demographics, family and relationships, lifestyle and interests, and other criteria.

The study was advertised to participants who: (a) were a parent, caregiver, or legal guardian to a child between the ages of 12–18 years, (b) were based within the United Kingdom, (c) had an internet-connected digital device, and (d) had an active account on Prolific.[18] Exclusion criteria were applied to participants who could not proficiently read or write in English.

This study received ethical approval from the University of Bath Biomedical Research Ethics Approval Committee (reference number: 3562–5933) and the protocol was registered on the Open Science Framework (https://osf.io/95dmw/). Patients and the public were not included when designing this research.

Procedures

Through Prolific, researchers can advertise studies to a predefined group of participants, based on their demographic data. Therefore, this study was advertised to participants who met our eligibility criteria (i.e., were caregivers of children between 12 and 18 years of age, etc). From the Prolific online registry, individuals interested in participating were directed to an online QuestionPro survey. Participants first read an information sheet and completed a consent form before completing the study.

Participants completed a demographic questionnaire, measures, vignettes, attention check questions, and lastly a debrief information sheet. Participants were paid £5.75 based on 30 min participation. Prolific recommends paying participants £9.00/hour, however, we paid participants the equivalent of minimum wage in the UK (£11.44/hour for adults aged 21 of age or over, 2024).

Measures

Demographics

Caregivers reported their sex, ethnicity, marital status, socioeconomic status, and how many children they cared for.

Caregiver and child chronic pain status

Caregivers reported their child's chronic pain status and their own chronic pain status (pain lasting for 3 months or longer). Caregivers who reported that they or their child had chronic pain were asked to report whether they had received a diagnosis for their pain condition.

Protective behaviours

Caregivers completed the Adult Responses to Child Symptoms (ARCS) questionnaire.[15] This 29-item questionnaire assessed protectiveness, discouraging or minimising responses, and encouraging or monitoring responses to children's pain symptoms. Responses are rated on a 5-point scale ranging from 'never' to 'always'. Responses are averaged per subscale, with higher scores indicating higher levels of protectiveness, minimising, or monitoring. The measure showed good internal consistency in our sample ($\alpha = 0.86$).

General anxiety

We assessed caregiver general anxiety using the General Anxiety Disorder-7 item (GAD-7) questionnaire.[19] This 7-item measure assessed general anxiety symptoms over the previous two weeks and responses are recorded on a 4-point scale (0=not at all, 3=nearly every day). Responses were scored and can be categorised into mild, moderate, moderately severe, or severe anxiety. The GAD-7 is had excellent internal consistency in our sample ($\alpha = 0.93$).

Depression

We assessed depression symptoms in caregivers using the Patient Health Quesitonnaire-9 item (PHQ-9) questionnaire.[20] Depression symptoms are measured on a 4-point response scale, similar to the GAD-7 (0=not at all, 3=nearly every day). Items are summed and can indicate mild, moderate, moderately severe, and severe depression. The PHQ-9 is a valid and reliable measure [20] and had excellent internal consistency in our sample ($\alpha = 0.90$).

Pain catastrophising for parents

Caregivers completed the Pain Catastrophising Scale for Parents (PCS-P).[21] The measure is 13 items and caregivers rate statements on a 5-point Likert scale (0 = not at all, 4 = extremely). The measure asks caregivers about thoughts and feelings they have when their child is experiencing pain and includes items such as 'When my child is in pain, I worry all the time about whether the pain will end'. Higher scores indicate higher levels of catastrophising. The scale had excellent internal consistency in our sample ($\alpha = 0.94$).

Fear of pain about child's pain experience

Participants complete the Fear of Pain Questionnaire for Parents (PFOPQ) to assess caregivers fears about their child's experience of pain.[22] The questionnaire includes 21 items and four subscales: fear of pain, fear of movement, fear of school and avoidance. Items such as 'I avoid making plans because of my child's pain' and 'My child doesn't go to school because I think it makes the pain worse' are included. The scale has been psychometrically tested and showed excellent internal consistency in our sample ($\alpha = 0.94$).

Vignettes

Child selection

Before completing the vignettes, caregivers were asked to choose one child to think about when responding to the following situations. They were asked to choose a child between 12 and 18 years of age and report the age of the child they had chosen. They also reported if it was their youngest, middle, oldest, or only child, how long they had been involved in their childcare, sex of the child, ethnicity of the child, and their relationship to the child (biological, stepparent, foster parent).

Pain stems

Question Pro's internal computer-generated randomisation procedure was used, meaning participants were assigned to a random sequence of the following vignettes:

1. No Pain ("…*your child is not experiencing any pain*…")
2. Acute Pain ("…*your child has been experiencing the same pain for 1 week.*.")
3. Chronic Pain ("…*your child has been experiencing the same pain for 6 months.*.")

No pain, acute and chronic pain descriptions are based on duration of pain, using the definition of chronic pain lasting for longer than 3 months.[23] Several deliberate decisions were made to keep the pain descriptions uniform. We intended to make the vignettes ambiguous and threatening to elicit protective responses. First, the specific type of pain the child was experiencing was not specified in any vignette. Second, the vignettes described the pain had prevented children from doing some activities and was painful enough to seek medical attention, but did not give a diagnosis or treatment plan for the pain. This meant that the caregivers' decision to the vignettes was based on their own judgement of the pain, rather than influenced by medical advice. Caregivers were told that the child always wanted to the do the activity described. It was important to state the child's intent because the variability in their preferences could have influenced caregiver's responses.

An example of the acute pain stem stated: *"For the following situations, your child has been* ***experiencing the same pain for the last week.*** *Your child has been complaining about this pain repeatedly and it has stopped them from taking part in some of their usual activities. You can see that your child is struggling with the pain and is not themselves. You have seen the doctor about the pain, but they still tell you that they have pain. Your child wants to take part in the following activities despite their pain."*

Types of activities

Each pain stem was followed by imagined activities. There were 4 activity categories in total and each included 5 items. The categories included 1) sport (e.g., your child is planning to take part if a swimming lesson later today), 2) school-related (e.g., your child is planning to complete their math homework later today), 3) chores (e.g., you child is planning to tidy their room later today), and 4) social activities (e.g., your child is planning to go to the cinema with a family member later today). Described activities were always in the future, which provided the caregiver with the opportunity to report whether they would be likely to prevent the child from taking part due to the described pain. We had previously piloted up to 10 items per category and reduced this to 5 per category for the final study to reduce burden and remove items that reduced the internal consistency of the category. The friend-related activities and family-related activities elicited almost identical responses and were therefore merged. Internal consistencies for vignettes describing no pain ranged from 0.97 to 0.99, vignettes describing acute pain ranged from 0.93 to 0.98, and vignettes describing chronic pain ranged from 0.94 to 0.98.

Responses to vignettes

Following each vignette, caregiver protectiveness was assessed across four different activity types; *sports*, *schoolwork*, *chores*, and *social events*. Protectiveness was operationalised in this study by the caregiver indicating how likely they would be to stop their child from doing the described activity. Caregivers were asked to respond to the question "How likely are you to stop your child doing each activity?" Caregivers used a 5-point Likert scale (0 = extremely unlikely, 4 = extremely likely). Full vignettes and stems are included in Supplementary material A.

Attention checks questions

Following the vignettes, participants were asked to report how much attention they paid to the study (5-point Likert scale from 0=almost no attention, to 4=my full attention) and whether they thought we should use their data in the analyses (yes/no).

Data analysis plan

A comprehensive data analysis plan was pre-registered on OSF (https://osf.io/95dmw/).

An a priori power analysis, based on an estimated effect size of Cohen's d = 0.28 derived from a feasibility sample, indicated that a minimum of 156 participants was required to achieve 80% power at an α level of 0.05. To account for potential attrition and ensure robust data collection, we increased our recruitment target by 2.5%, resulting in a final target sample size of 160 participants.

Data were analysed using the R programming language [24] within the integrated development environment, RStudio (version 2024.09.1)[25].

Counts (%) for categorical variables and means (*M*) and standard deviations (*SD*) for continuous variables were calculated. For each pain type and activity type, an average protectiveness score from the vignettes was calculated for use in the analyses.

To investigate if caregivers were more protective of children dependent on imagined pain type, a Linear Mixed Model (LMM) was conducted, controlling for the age of caregiver and child, sex, and chronic pain statuses of reporting caregivers and their selected children. Random ID intercepts for the reporting caregiver accounted for repeated measures.

To investigate if caregivers were more protective of children dependent on activities, a Linear Mixed Model (LMM) was conducted, controlling for the caregivers' and children's ages, sex, and chronic pain statuses. Random ID intercepts for the reporting caregiver accounted for repeated measures.

Finally, to determine if caregivers with higher anxiety, depression, pain catastrophising or fear of child's pain were more protective on vignettes, a correlation between all variables was conducted followed by a Multiple Linear Regression (MLR), whilst controlling for demographics in the latter analysis.

For each model, analyses were restricted to participants with complete case responses and all statistical outliers retained. If significant violations of model assumptions were identified, we used robust statistical methods (e.g., BCa bootstrapping). In line with our pre-registered data analysis plan, no methods of data replacement were applied. For all models, significance was determined at $\alpha = 0.05$.

Results

Participant flow

210 participants accessed the information sheet and 160 (76.2%) were deemed eligible and consented to participate. 159 participants completed the vignette sequence, but some participants skipped over crucial questions and could not be included in some analyses (see Fig. 1). All attention checks were met and there were no indicators of inattention or random responding. Participants took an average of 25 min to complete the study. An overview of participant progression is provided in Fig. 1.

Participant characteristics

The recruited sample was largely homogenous; participants were of an average age of 42.72 years (SD=8.30 years), female (n=94/159, 59.1%), ethnically white (n=108/159, 67.9%), educated to undergraduate level or higher (n=104/159, 65.4%), and employed (n=148/159, 93.1%). However, there was a relatively even distribution of household incomes above (n=84/159, 52.8%) and below (n=75/159, 47.2%) £50,000. A substantial number of caregivers reported to be currently experiencing chronic pain (n=75/159, 47.2%) and had received a diagnosis for this pain (n=41/159, 25.8%). Demographic information of the reporting caregivers is provided in Table 1.

Most children were biologically related to the reporting caregiver (n=150/159, 94.3%), were clustered towards the lower end of the required 12–18-year range (M=13.96, SD=1.87), and ethnically white (n=104/159, 65.4%). Caregivers were asked to choose one child when responding to the vignettes and we found sex was evenly distributed between males (n=80) and females (n=79). Demographic information for the selected child is provided in Table 2.

Before testing our primary hypotheses, the relationship between caregiver-reported protectiveness (averaged score from all acute and chronic pain vignettes) and the ARCS protectiveness subscale was examined using Pearson's product-moment correlation. The analysis revealed a small, significantly positive correlation (r=0.17, p=.047).

Perceived protectiveness by pain type

Protectiveness scores were averaged across all activities for each pain type. Caregivers were least protective when they imagined their child to be experiencing no pain (M=0.71, SD=1.11) compared to pain vignettes. There was little difference between imagined chronic pain (M=1.69, SD=0.90) and acute pain (M=1.77, SD=0.88) vignettes. The distribution of caregiver protectiveness across pain types is depicted in Fig. 2.

A linear mixed-effects model (LMM) was conducted to examine the effects of pain type on caregiver protectiveness. The model included pain type as a fixed effect and controlled for the ages, sex, and chronic pain statuses of the reporting caregiver and their child. The model revealed that pain type was significantly associated with caregiver protectiveness (p's<.001). Post-hoc Tukey's HSD comparisons revealed that caregiver protectiveness was significantly higher for both acute pain (est. mean difference (MD)=-1.04, p<.001) and chronic pain (est. MD=-0.96, p<.001) than for no pain. However, there was no significant difference between acute pain and chronic pain (est. MD=0.07, p=.468).

Large effect sizes were observed for the comparisons between no pain and both acute pain (Cohen's d=-0.93, 95% CI [-1.04, −0.81]) and chronic pain (d=-0.86, 95% CI [-0.98, −0.75]). However, the contrast between acute pain and chronic pain was not significant (d=0.07, 95% CI [-0.05, 0.18]).

Beyond these findings, caregiver age was also significant; older caregivers reported lower protectiveness (b=-0.02, t=-2.23, p=.027). The fixed effects for the model are shown in Table 3, and post-hoc comparisons, including effect sizes, are presented in Table 4.

Perceived protectiveness by activity type

Protectiveness scores across all pain types for each vignette activity were averaged. Descriptively, caregiver protectiveness was highest when caregivers imagined that their children planned to engage in sports (M=1.97, SD=0.83), with scores gradually decreasing across chores (M=1.51, SD=0.97), social events (M=1.21, SD=0.94), and schoolwork (M=0.87, SD=0.97). The distribution of caregiver protectiveness across activity types is depicted in Fig. 3.

A LMM was conducted to examine the effects of activity type on caregiver protectiveness. The model included activity type as a fixed

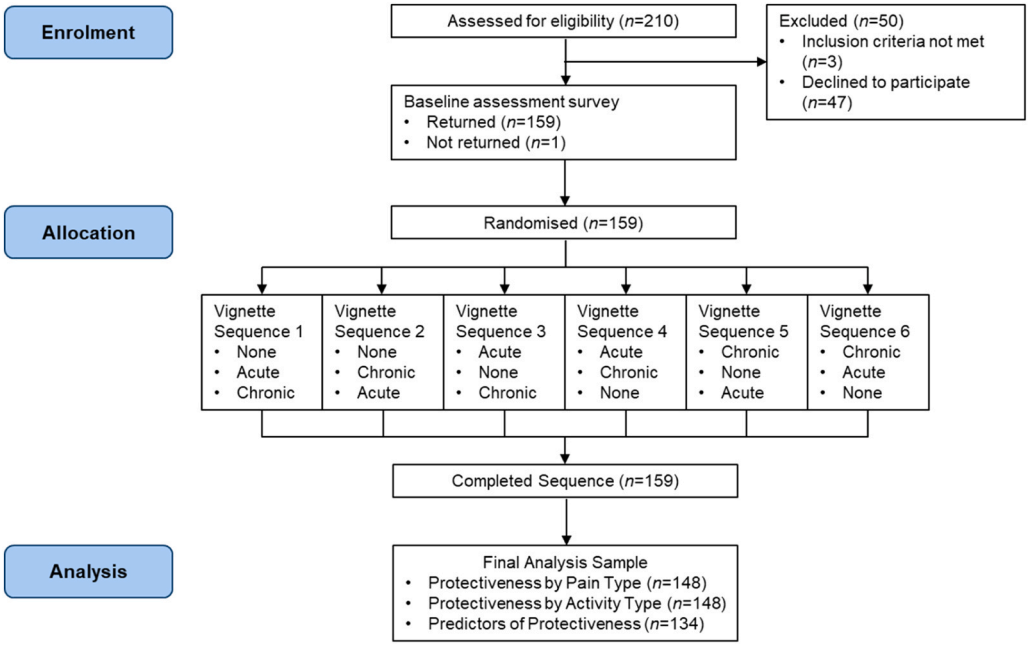

Fig. 1. CONSORT Participant Flow Diagram.

Table 1
Caregiver demographic information (n = 159).

Demographic Variable	*n*	%
Age (years; *M*, *SD*)	42.72	(8.30)
Not reported	0	0.0%
Sex		
Female	94	59.1%
Male	65	40.9%
Other	0	0.0%
Not reported	0	0.0%
Ethnicity		
White	108	67.9%
Asian or Asian British	7	4.4%
Black or Black British	32	20.1%
Mixed ethnic group	6	3.8%
Other ethnic group	5	3.1%
Not reported	1	0.6%
Education		
Secondary education	25	15.7%
College	30	18.9%
Undergraduate	63	39.6%
Postgraduate	41	25.8%
Not reported	0	0.0%
Employment Status		
Employed full-time	128	80.5%
Employed part-time	20	12.6%
Unemployed	11	6.9%
Not reported	0	0.0%
Household Income		
< £10,0000	10	6.3%
£10,000 - £19,999	26	16.4%
£20,000 - £49,999	39	24.5%
£50,000 - £79,999	46	28.9%
£80,000 - £119,999	27	17.0%
£120,000–149,999	7	4.4%
>£150,000	4	2.5%
Not reported	0	0.0%
Chronic Pain Status		
Current chronic pain	75	47.2%
No chronic pain	82	51.6%
Not reported	2	1.3%
Chronic Pain Diagnosis		
Received diagnosis	41	25.8%
No diagnosis	36	22.6%
Not reported	82	51.6%
Anxiety		
GAD-7 (*M*, *SD*)	6.09	(5.41)
Minimal (Scores 0–4)	71	44.7%
Mild (Scores 5–9)	47	29.6%
Moderate (Scores 10–14)	24	15.1%
Severe (Scores 15–21)	14	8.8%
Not Reported	3	1.9%
Depression		
PHQ-9 (*M*, *SD*)	6.48	(5.40)
Minimal (Scores 0–4)	76	47.8%
Mild (Scores 5–9)	38	23.9%
Moderate (Scores 10–14)	26	16.4%
Moderately Severe (Scores 15–19)	13	8.2%
Severe (Scores 20–27)	2	1.3%
Not Reported	4	2.5%
Pain Catastrophising		
PCSP Score (*M*, *SD*)	23.69	(11.77)
Not Reported	3	1.9%
Parent Fear of Pain		
PFOPQ Score (*M*, *SD*)	37.20	(17.22)
Not Reported	6	3.8%
Parenting behaviours		
ARCS (all items; M, *SD*)	2.16	0.44
Protectiveness subscale (M, *SD*)	2.23	0.67

ARCS: Adult Responses to Child Symptoms; GAD-7: General Anxiety Disorder-7 item; PHQ-9: Patient Health Quesitonnaire-9 item; PCS: Pain Catastrophising Scale; PFOPQ: Fear of Pain Questionnaire for Parents

Table 2
Caregiver-reported demographic information of selected child (n=159).

Demographic Variable	*n*	%
Caregiver Relation		
Biological parent	150	94.3%
Stepparent	5	3.1%
Adoptive parent	1	0.6%
Foster carer	0	0.0%
Non-parent family	3	1.9%
Not reported	0	0.0%
Age (years; *M*, *SD*)	13.96	(1.87)
Not reported	0	0.0%
Sex		
Female	79	49.7%
Male	80	50.3%
Other sex	0	0.0%
Not reported	0	0.0%
Ethnicity		
White	104	65.4%
Asian or Asian British	6	3.8%
Black or Black British	30	18.9%
Mixed ethnic group	14	8.8%
Other ethnic group	5	3.1%
Not reported	0	0.0%
Chronic Pain Experience		
Current chronic pain	26	16.4%
No chronic pain	133	83.7%
Not reported	0	0.0%
Chronic Pain Diagnosis		
Received diagnosis	10	6.3%
No diagnosis	16	10.1%
Not reported	133	83.7%

effect and controlled for the ages, sex, and pain statuses of caregivers and their children.

Activity type was significantly associated with caregiver protectiveness (p's<.001). Post-hoc pairwise comparisons revealed statistically significant differences between all activity types. Effect sizes ranged from small to large. The fixed effects for the model are shown in Table 5, and pairwise comparisons, including effect sizes, are presented in Table 6.

In addition, caregiver age was also significant. Similar to protectiveness by pain type, older caregivers reported lower protectiveness (b=−0.02, t=-2.24, p=.027).

Predictors of perceived caregiver protectiveness

To explore factors associated with caregiver protectiveness, Pearson's product–moment correlations were conducted between the variables presented in Table 7. As there was no significant difference in protectiveness scores for imagined acute and chronic pain, protectiveness responses were averaged across pain types to create a single caregiver protectiveness score. Caregiver protectiveness was positively associated with pain catastrophising (r=0.31, p<.001) and parent fear of pain (r=0.32, p<.001), with both relationships in the moderate range. Caregiver protectiveness was not significantly associated with anxiety (r=0.04, p>.05) or depressive symptoms (r=0.07, p>.05).

A multiple linear regression was conducted to examine whether caregiver anxiety, depression, pain catastrophizing, and caregiver-reported fear of their child's pain was associated with caregiver protectiveness in vignettes. Similar to the correlation, as there was no difference between acute and chronic pain vignettes, we used the combined protectiveness score as the dependent variable. Demographic variables of caregiver age, child age, caregiver sex, child sex, and presence of chronic pain were statistically controlled.

The overall model was statistically significant, F(10, 127)=3.07, p=.002), indicating that the predictors collectively explain a significant amount of variance in perceived caregiver protectiveness (R^2=.19, adjusted R^2=.13).

Caregiver anxiety was negatively associated with caregiver

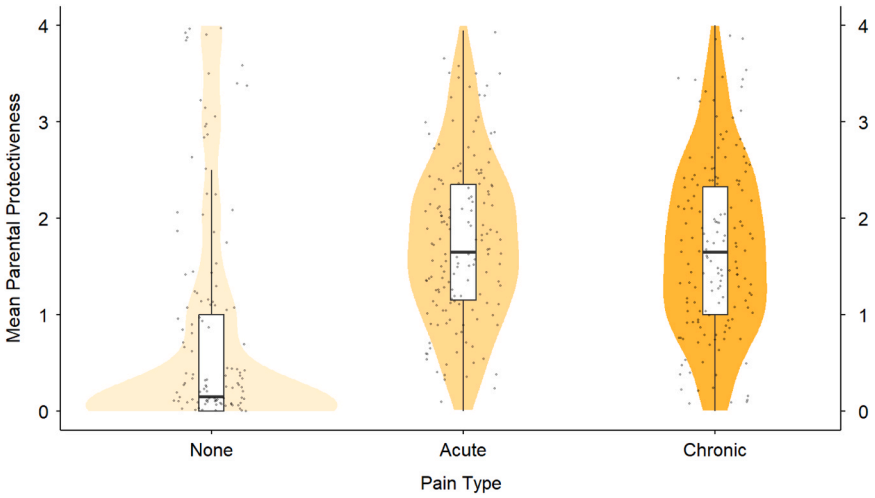

Fig. 2. Grouped violin plots of caregiver protectiveness across pain types. *Note*. Violins depict the frequency distribution of caregiver protectiveness scores for each *pain type* (i.e., *no pain* [light], *chronic pain* [medium], and *acute pain* [dark]). Boxplots highlight the data's median (centre line), IQR (box), and 1.5x IQR (whiskers). Individual observations are depicted as horizontally-jittered points.

Table 3
Fixed effects for the linear mixed model, pain type (n=148).

Predictor	*b*	*SE*	*t*	*p*
No pain (intercept)	2.01	0.50	4.28	<.001
Acute pain	1.04	0.06	16.34	<.001
Chronic pain	0.96	0.06	15.21	<.001
Age of caregiver	-0.02	0.01	-2.23	.027
Age of child	-0.04	0.03	-1.09	.279
Caregiver sex	-0.18	0.12	-1.59	.114
Child sex	0.06	0.11	0.57	.567
Chronic pain of caregiver	0.08	0.12	0.67	.505
Chronic pain of child	-0.02	0.15	-0.14	.887

SE: standard error

Table 4
Pairwise comparisons and effect sizes, pain type (n=148).

Contrast	est. *MD*	SE	t	p	Cohen's *d*	95% CI
No pain- acute pain	-1.04	0.06	-16.33	<.001	-0.93^{L}	[-1.04, −0.81]
No pain - chronic pain	-0.96	0.06	-15.20	<.001	-0.86^{L}	[-0.98, −0.75]
Acute pain - chronic pain	0.07	0.06	1.17	.470	0.07^{N}	[-0.05, 0.18]

Note. Letter notation (^{N} or ^{S} or ^{M} or ^{L}) respectively refer to negligible ($d \leq 0.20$), small ($0.20 < d \leq 0.50$), medium ($0.50 < d \leq 0.80$), and large ($d > 0.80$) effect sizes. MD: mean difference, SE: standard error, CI: confidence interval.

protectiveness (b=-0.05, t=-2.14, p=.034), indicating that higher caregiver anxiety was associated with lower protectiveness. This effect should be interpreted as a conditional association, as bivariate correlations between anxiety and protectiveness were not significant. Other variables, including fear of pain, depression, and pain catastrophizing, were not associated with caregiver protectiveness (Table 8). Multicollinearity diagnostics indicated acceptable levels (VIFs=1.05–3.83).

Discussion

This study aimed to understand caregiver protectiveness relating to different contexts and imagined pain states to better understand when caregivers are more protective in relation to their child's pain. Analyses revealed caregivers were more protective of their child when they imagined them in pain compared to no pain, but there was no difference between imagined acute and chronic pain scenarios. When considering the type of activity, we identified significant differences between all activity types, with caregivers reporting higher perceived protectiveness for sports, followed by chores, social events and homework eliciting the lowest protective responses.

This is the first study to investigate caregiver protectiveness in different situations and for different imagined pain states. Caregiver protectiveness is most often captured through self-report in the ARCS by either the child or caregiver. Whilst this scale is psychometrically sound,[14,15] it does not consider context-specific factors which we have explored here. Caregiver protectiveness is often considered a global behaviour, one that lacks specificity in situational determinants of protective behaviours. Pain impacts every area of functioning in children and adolescents, but caregivers are protective to different degrees depending on the task interrupted. Understandably, more physically demanding activities elicited the highest level of protectiveness in the current study, whereas caregivers were less likely to be protective and excuse their children from sedentary tasks, such as doing schoolwork, despite being in pain. Another finding was that older caregivers reported lower protectiveness scores for imagined scenarios compared to younger caregivers. Caregiver age has been unexplored in relation to protectiveness, but this finding shows caregiver age could be an important factor.

The lack of difference between imagined acute and chronic pain vignettes was contrary to our hypotheses. For children who report chronic pain, caregiver protectiveness is often cast as a maladaptive behaviour preventing children from doing their usual activities, increasing deconditioning, which in turn may cause more pain.[26] As the pain is not signalling harm, treatments encourage children to return to usual activities, albeit at perhaps a lesser intensity or frequency. Therefore, we hypothesised that caregivers would have reported higher protectiveness for acute pain compared to chronic pain or no pain. However, the vignettes did not use the terms 'acute' or 'chronic pain', but rather emphasised the duration of pain (i.e., 'experiencing the same pain for 1 week', 'experiencing the same pain for 6 months'). This might have influenced their interpretation of the severity of pain and perceived behaviours. The lack of difference in this study presenting hypothetical situations suggests that caregivers are consistent in their behaviours irrespective of the duration of pain and these behaviours might not fluctuate over time.

Caregivers may have interpreted both imagined acute and chronic pain as a symptom of a disease or injury which could be worsened with activity, or for which recovery could be retarded by activity. The

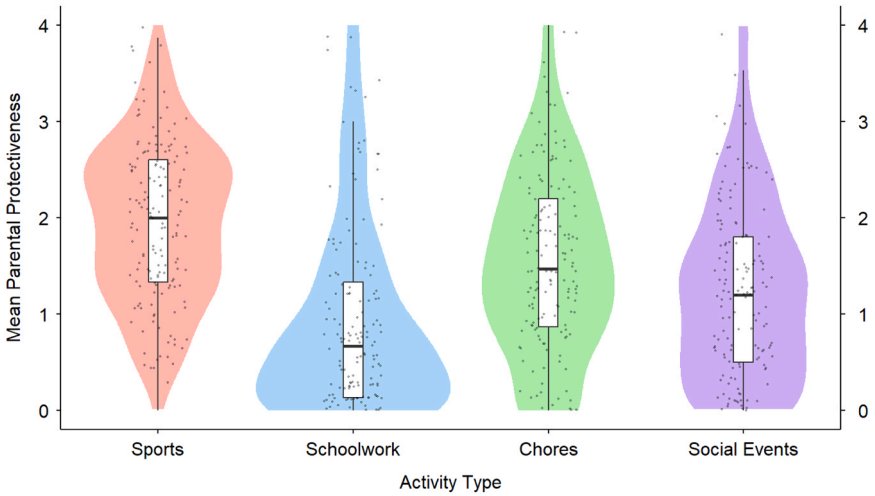

Fig. 3. Grouped violin plots of caregiver protectiveness for each activity type. *Note*. Violins depict the frequency distribution of caregiver protectiveness ratings for each activity type (i.e., sports [red], schoolwork [blue], chores [green], and social events [purple]). Boxplots highlight the data's *median* (centre line), IQR (box), and 1.5x IQR (whiskers). Individual observations are depicted as horizontally-jittered dots.

Table 5
Fixed effects for the linear mixed model, activity type (n=148).

Predictor	*b*	*SE*	*t*	*p*
Sports (Intercept)	3.25	0.47	6.89	<.001
Schoolwork	-1.07	0.08	-14.21	<.001
Chores	-0.44	0.08	-5.86	<.001
Social events	-0.73	0.08	-9.64	<.001
Age of caregiver	-0.02	0.01	-2.24	.027
Age of child	-0.04	0.03	-1.15	.254
Caregiver sex	-0.19	0.12	-1.64	.102
Child sex	0.07	0.11	0.60	.549
Chronic pain of caregiver	0.08	0.12	0.69	.488
Chronic pain of child	0.00	0.15	-0.01	.991

SE: standard error.

Table 6
Pairwise comparisons and effect sizes, activity type (n=148).

Contrast	est. *MD*	SE	t	p	Cohen's *d*	95% CI
Sports - schoolwork	1.07	0.08	14.20	<.001	0.93^{L}	[0.80, 1.06]
Sports - chores	0.44	0.08	5.85	<.001	0.38^{S}	[0.25, 0.51]
Sports - social events	0.73	0.08	9.63	<.001	0.63^{M}	[0.50, 0.76]
Schoolwork - chores	-0.63	0.08	-8.34	<.001	-0.55^{M}	[-0.68, −0.42]
Schoolwork - social events	-0.35	0.08	-4.58	<.001	-0.30^{S}	[-0.43, −0.17]
Chores - social events	0.28	0.08	3.77	.001	0.25^{S}	[0.12, 0.38]

Note. Letter notation (^{N} or ^{S} or ^{M} or ^{L}) respectively refer to negligible ($d \leq 0.20$), small ($0.20 < d \leq 0.50$), medium ($0.50 < d \leq 0.80$), and large ($d > 0.80$) effect sizes. MD: mean difference, SE: standard error, CI: confidence interval.

primacy of promoting avoidance of movement behaviour fits with the dominant cultural view of pain as a sign of injury. Pain is often believed to mean tissue damage and therefore, protecting the child from experiencing more pain by stopping activities is an adaptive response. Paradoxically, current evidence supports movement and physical activity in chronic pain,[27] social participation is protective of long-term disability,[28] and cognitive work (school homework) can be effortful when lack of distraction allows for greater pain interruption.[29] We should perhaps not expect caregivers to behave toward acute and

Table 7
Pearson correlations with caregiver protectiveness (n=136).

Variable	1.	2.	3.	4.	5.	6.
1. ARCS Protectiveness	-					
2. Protectiveness	0.17*	-				
3. Anxiety	0.30**	0.04	-			
4. Depression	0.28**	0.07	0.83**	-		
5. Pain catastrophizing	0.52**	0.31**	0.47**	.38**	-	
6. Parent fear of pain	0.52**	0.32**	0.38**	.33**	.81**	-

Note. *$p<0.05$; **$p<.001$. Letter notation (^{N} or ^{S} or ^{M} or ^{L}) respectively refers to negligible ($r<.10$), small ($.10 \leq r < .30$), moderate ($.30 \leq r < .50$), and large ($r \geq .50$) effect sizes.

Table 8
Multiple linear regression predicting caregiver protectiveness (n=138).

Predictor	*b*	*SE*	*β*	*t*	*p*
Protectiveness (intercept)	2.10	0.64	-	3.27	<.001
Anxiety	-0.05	0.02	-0.32	-2.14	.034
Depression	0.03	0.02	0.19	1.20	.232
Pain catastrophizing	0.01	0.01	0.18	1.29	.199
Parent fear of pain	0.01	0.01	0.22	1.68	.095
Age of caregiver	-0.01	0.01	-0.11	-1.22	.223
Age of child	-0.06	0.04	-0.12	-1.38	.170
Sex of caregiver	-0.06	0.14	-0.33	-0.39	.696
Sex of child	0.21	0.14	0.12	1.47	.145
Chronic pain of caregiver	0.10	0.15	0.06	0.69	.491
Chronic pain of child	0.20	0.18	0.09	1.08	.284

Note. SE: standard error.

chronic pain differently in their child, as in the moment, it is simply a child in pain needing protection. An alternate view of chronic pain as something to behave differently toward might not emerge naturally and might only be achieved through specific intervention. There have been few investigations of the longitudinal changes in caregiver protectiveness for children who transition from acute and chronic pain and whether protectiveness changes over time. Although there was about half the sample (47%) who reported chronic pain themselves, relatively few reported that their child had chronic pain (16%) and therefore, may lack experience of such a specific intervention which promotes activity engagement despite pain when the child experiences chronic pain.

Previous studies in acute musculoskeletal pain found that cross-sectionally, higher caregiver protectiveness was associated with higher child pain intensity [30] and longitudinally, higher caregiver

protectiveness was associated with higher child pain interference at 3 months.[31] This is replicated in chronic pain samples.[5,7,32] This relationship between caregiver behaviours and child symptoms and behaviours is likely to be bidirectional, reinforcing that pain is a truly biopsychosocial experience and influenced by other's behaviours or distress.

To explore whether we could predict protectiveness beyond the contextual factors, we analysed whether caregiver anxiety, depression, pain catastrophising or fear of pain predicted the caregivers' responses. We predicted that higher distress (i.e., anxiety, depression, fear of pain etc) would be associated with higher protectiveness for imagined scenarios, rather than lower protectiveness, informed by the interpersonal fear avoidance model.[22] Significant positive correlations between caregiver protectiveness and caregiver catastrophising and fear of pain, but not anxiety and depression were revealed. However, when combined in a regression model, we found only higher caregiver anxiety was associated with lower perceived protectiveness, contrary to our hypothesis. This finding is also contrary to previous literature which shows that higher caregiver distress is associated with higher protective behaviours.[9,10] In this context, although multicollinearity diagnostics indicated acceptable levels, the high intercorrelations among variables may have introduced suppression effects or instability in the model, and the regression findings may therefore be spurious. No other distress variables were associated with perceived protectiveness in the regression. The sex of the child was also not associated of protectiveness, whereas previous literature has shown that caregivers are more protective of girls compared to boys.[13,30]

There are some limitations of this study including the assessment of caregiver protectiveness via vignettes. First, the validity and reliability of the vignettes was not fully explored. However, the internal consistencies were acceptable and the protectiveness scores from the vignettes significantly correlated with the protectiveness subscore of the ARCS, which was also similar to previous studies of caregivers of children with acute and chronic pain.[13,14] Nevertheless, further research could support their content validity and reliability for future use. For each assessment, participants were asked to imagine that their child was experiencing a given pain type and activity type. While vignettes are a valuable tool and can describe real-world scenarios, it is important to acknowledge that imagined situations may not fully replicate the complexities of real-life experiences. We also recognise that other contextual factors are also likely to influence caregiver protectiveness and need to be explored further such as child distress in relation to pain, family dynamic, and goal-related behaviours. Finally, whilst 160 participants were recruited for the study in accordance with our power analysis, some incomplete responses meant the sample for our primary analysis was 148 and secondary analysis investigating predictors of protectiveness was 138 and therefore underpowered. Nevertheless, this study still adds to the literature by exploring changes in caregiver protectiveness due to context or pain state.

There are several strengths of this study. Prior research has largely conceptualised caregiver protectiveness as a static state-of being, rather than a dynamic trait.[33] This has limited researchers' ability to examine how protective tendencies may vary across pain contexts. We have used a different methodology to understand caregiver protectiveness and this study marks the first instance of within-subject comparisons across multiple levels of pain type and activity type. This perspective helps to provide a more nuanced understanding of caregiver protectiveness.

While pain state and activity type have been identified as important factors in determining caregivers' protective tendencies, they are not the only factors at play. The current study showing that caregiver protectiveness is likely to be a dynamic, context-dependent phenomenon will hopefully inspire future research to investigate other potential influences, such as (a) the physical location of the pain (e.g., does lower limb pain elicit more protectiveness than upper limb, as mobility may be more impaired), (b) the specific injury, illness, or event causing the pain (e.g., if injured during sport, is the caregiver more protective of the child in that specific context compared to others) or (c) whether protective behaviours extend to attending school, rather than just completing homework. Expanding research in this area could provide a more granular picture of the factors that shape caregivers' protective tendencies, and in turn, be used to better inform the development of future interventions aimed at supporting caregivers.

In conclusion, caregiver protectiveness is a dynamic, context-dependent behaviour. There were no differences between caregivers' protectiveness in acute and chronic pain vignettes, however, caregivers reported higher levels of protectiveness for sports and the lowest level of protectiveness for schoolwork.

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Data statement

All analysis code, metadata files, and de-identified participant data are publicly available via the Open Science Framework (OSF) at DOI 10.17605/OSF.IO/95DMW. These materials are provided in compliance with ethical guidelines and participant confidentiality requirements. For further information or inquiries about the data, please contact the corresponding author, Emma Fisher.

Study pre-registration

The study was pre-registered on OSF: https://osf.io/95dmw/

Conflicts of interest

The authors do not have any conflicts of interest to declare.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.jpain.2026.106352.

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