Cognitive Performance in the Aftermath of a Natural Disaster: The Role of Coping Strategies, Theory of Mind and Peer Social Support

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Abstract

Background In May 2012, Northern Italy was struck by a tremendous series of earthquakes, which had devastating consequences and persisted for several months. Previous research shows that coping strategies and Theory of Mind (ToM) can help sustaining cognitive performance after a traumatic experience.

Objective We conducted a study to examine whether coping strategies used by elementary school children who were victims of the earthquakes were helpful in facing the consequences of these earthquakes by being positively associated with ToM and, in turn, with better cognitive performance.

Methods We administered a questionnaire to 517 elementary school children a few months after the earthquakes of May 2012.

Results Results revealed that active coping strategies were associated with greater ToM abilities that, in turn, were related with better cognitive performance. In contrast, negative coping strategies were negatively associated with the ability to mentalize others’ mental states and, in turn, with less positive cognitive performance. Avoidant coping strategies were positively associated with improved cognitive performance. Moreover, they were also associated with better cognitive performance via greater ToM abilities (this latter effect was present only among those perceiving stronger social support from their peers).

Conclusions Active and avoidant coping strategies and ToM are important factors associated with better cognitive performance in the aftermath of a natural disaster.

Keywords Coping strategies · Theory of Mind (ToM) · Peer social support · Natural disaster · Cognitive performance

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Introduction

In May 2012 two earthquakes, measuring respectively 5.9 and 5.8 points on the Richter scale, struck Emilia Romagna, a region located in Northern Italy. These earthquakes caused the death of 27 people, and more than 300 individuals were injured. A high percentage of the houses was severely damaged and about 40,000 people were left homeless. The earthquakes seriously damaged several school buildings, so that alternative temporary buildings had to be arranged for school use. It is likely that children were deeply affected not only by these events, but also by the observation of other people, such as their parents, trying to deal with the consequences of the earthquakes on their homes, work and daily life (e.g., Leen-Feldner et al. 2013). Trauma following a disaster has severe psychological consequences on children, who are often unable to fully understand its nature and whose ability to cope with the situation is limited (Furr et al. 2010; Pina et al. 2008). Children who are exposed to disasters typically report psychological distress symptoms, which interfere with their emotional and cognitive functioning (Gurwitch et al. 2002; Kar and Bastia 2006; La Greca et al. 2010). Consistently, there is evidence that elementary school children from the areas struck by the earthquakes considered in the present study revealed considerable levels of Post Traumatic Stress Disorder (PTSD; Cadamuro and Versari 2012), a health disorder that can severely impair children’s psychological functioning (Furr et al. 2010). In such cases, it is crucial to identify the factors that help children to cope with the traumatic event in order to counter its detrimental effect on psychological functioning.

The aim of the present research is to test whether coping strategies used to deal with the traumatic event have beneficial effects on the cognitive performance of young children. Specifically, we are interested in examining whether and how specific types of coping strategies are related to improved cognitive performance. The key factor of our analysis is represented by Theory of Mind (ToM; Premack and Woodruff 1978), which may result strengthened as a function of specific types of coping strategies and, in turn, may be associated with improved cognitive performance. An additional aim is to test the boundary conditions (and, in particular, the moderator role of peer social support) that limit the effects of coping strategies.

Cognitive Outcomes in the Aftermath of Natural Disasters

Findings from studies conducted with adult samples show that there are systematic biases evident on various measures of attention and memory for threat-related and trauma-related information in traumatized individuals (Bahrick et al. 1998; Brandes et al. 2002; Brodman et al. 2011; Polak et al. 2012; Samuelson et al. 2009; Stein et al. 2002; Thrasher and Dalgleish 1999). Although there are conflicting reports on the extent to which general intelligence is influenced by traumatic experiences, some researchers have linked higher rates of PTSD symptoms stemming from trauma to lower intellectual functioning (IQ) scores. As an example, increased stress-related symptomatology in PTSD patients and in Vietnam combat veterans was found to be associated with lower scores on standardized IQ tests (Emdad and Søndergaard 2005; McNally and Shin 1995). In the case of children and adolescents, cognitive impairments following traumatic events may be associated with problems relating to school performance. In this regard, Weems et al. (2013) found that post-traumatic symptoms following a traumatic event (i.e., Hurricane Katrina) increased later test anxiety, which was in turn associated with lower academic achievement. Similar
to adults, children with post traumatic symptoms exhibit a spectrum of cognitive consequences following the trauma, including altered attentional processes, deficits in learning processes and inefficient memory systems (Yasik et al. 2007). Moreover, research revealed that traumatized and neglected children reveal lower IQ and academic achievement than children who are not exposed to these traumatic experiences (Bücker et al. 2012; De Bellis et al. 2002).

Nevertheless, there are relatively few studies in the literature concerning cognitive performances (e.g., test of non-verbal intelligence, academic achievement, etc.) of students who have been exposed to a stressful event like an earthquake. In one such study, Saigh et al. (1997) demonstrated that academic achievement of youths with PTSD after an earthquake was lower than that of both those not suffering from PTSD after the trauma and those who had not been exposed to any traumatic experience. On a similar line, Ceyhan and Ceyhan (2007) showed that academic achievement of earthquake survivors was lower than that of individuals not exposed to an earthquake. Based on this evidence, assessing the consequences of an earthquake among school children is fundamental in order to plan interventions aimed at reducing its negative impact on psychological functioning and, in particular, on cognitive performance.

Given the extent of detrimental consequences of trauma-related events including earthquakes (Chen et al. 2012; Kar 2009; Uemoto et al. 2012), it is important to identify protective factors. Previous research lists protective factors as coping strategies (Lazarus 1999), ToM (Sharp et al. 2012) and social support (Pina et al. 2008; Prati and Pietrantoni 2009; Schaefer and Moos 1998; Tedeschi and Calhoun 2004). In the present research we examine how these factors interact in sustaining cognitive performance. The key factor of our analysis concerns ToM ability, which is the focus of the next paragraph.

**ToM Skills and Their Effects on Psychological Functioning**

People who are especially able to manage emotions are thought to be better equipped to deal with stressful events. Recent studies suggest that disrupted psychological functioning following a traumatic event may be a function of deficits in the ability to understand others’ mental states and to understand and share emotions with others (Lanius et al. 2010; Mazza et al. 2012; Nietlisbach et al. 2010). These deficits signal a lack of key competences typical of ToM (Premack and Woodruff 1978). ToM is concerned with the ability to attribute mental states (e.g., beliefs, desires, intentions and emotions) to others and to use these attributions for predicting and explaining their behavior (Baron-Cohen 1995). It was found that persons who mentalize in the face of trauma are less vulnerable to psychiatric disorders (Allen et al. 2008). Indeed, the capacity to understand others’ mental states allows individuals to interpret, anticipate and influence others’ behavior and consequently to cope positively with stress. Conversely, impaired ToM processes prevent individuals from effectively making use of current social relationships or social support structures in order to dampen the negative impact of the trauma.

ToM has been shown to influence cognitive processes in a variety of domains, such as the ability to understand learning processes (Davis-Unger and Carlson 2008). Interventions aimed at promoting emotional understanding provided strong causal foundation for the role of ToM processes in improving literacy (Bierman et al. 2008; Greenberg et al. 1995). Other studies also found significant relationships between individual differences in preschool ToM skills and children’s self-monitoring ability in cognitive activities (Meichenbaum and Biemiller 1998), scientific thinking (Kuhn and Pearsall 2000) and narrative understanding.
(Pelletier and Astington 2004). More relevant for us, various studies demonstrated the existence of a positive correlation between ToM and cognitive performance, as exemplified for instance by academic achievement (e.g., Chen et al. 1997; Kloo and Perner 2008; Malecki and Elliott 2002). In other words, individuals with greater ability to understand others’ mental states are more likely to display a better cognitive performance (especially, when cognitive performance taps on fluid intelligence, as it is the case for the measure of cognitive performance we used in the present study; Ibanez et al. 2013). The relationship between ToM and children’s cognitive performance was also demonstrated by longitudinal studies, tapping into the causal impact of the ability to understand others’ mental states on school performance (e.g., Blair and Razza 2007; Izard et al. 2001). These results are not surprising, as recent studies demonstrated that tasks tapping on ToM processes activate brain areas similar to those involved in fluid intelligence, which is strongly associated with measures of cognitive performance (Roca et al. 2010). It is therefore critical to identify the factors that allow individuals to develop ToM abilities, in order to reduce the negative impact of traumatic events such as natural disasters on cognitive abilities (Moskowitz 2005; Sharp et al. 2012). One such factor, we argue, is represented by coping strategies. Below we provide the rationale for this hypothesis.

The Function of Coping Strategies

Coping can be defined as the thoughts and behaviors an individual uses to manage internal and external demands of situations which are appraised as stressful (Folkman and Moskowitz 2004). It is a product of the person-environment relationship, a complex multidimensional process sensitive to the demands and resources present in the environment, to personality dispositions that influence the appraisal of the stressors, and to the appraisal of the individual’s available resources (Aldwin 1994; Folkman and Lazarus 1991).

Importantly, people may use qualitatively different types of coping strategies, which are likely to have differential effects on psychological functioning. Schaefer and Moos (1998) distinguished between approach (active) and avoidant coping strategies. According to these authors, approach coping strategies are directed toward the stressor itself or one’s reaction toward it, whereas avoidance strategies are focused on avoiding the stressor or one’s reaction toward it. Approach coping strategies include positive reappraisal and are related to seeking emotional support, planning to resolve the stressor, and seeking information about the stressor. They can be considered as adaptive, as they generally help individuals to effectively cope with the stressful situation, resulting in positive outcomes. On the other hand, avoidance strategies may be considered maladaptive. They are related to behavioral and mental disengagement, denial of the traumatic event, wishful thinking, emotional discharge, seeking rewards from other activities, post-traumatic stress (Prati et al. 2011).

The role of avoidance coping after trauma exposure has been an issue of some debate in the adult trauma literature. Most etiological models of trauma-related symptoms conceptualize avoidant coping responses as reflecting incomplete cognitive processing of the event (Foa and Riggs 1993; Foa et al. 1989). However, there is also evidence that avoidance coping may reduce anxiety from the traumatic event, by permitting information processing. It seems to be a defensive strategy which allows the victim to contain the distress generated by re-experiencing the trauma (Edlynn et al. 2008). Research has shown that avoidance coping is associated with more positive adaptation in the short-run, whereas active coping has stronger long-term effects (Rantanen et al. 2011; Suls and Fletcher 1985; Taylor and Stanton 2007). Specifically, avoidance provides immediate relief from stress,
whereas increased active coping uncovers information that facilitates long-term adaptation (Holmes and Stevenson 1990).

There is also a third type of coping strategy, which can be considered as maladaptive. Spirito et al. (1988) identified “negative strategies,” related to reactions like self-criticism and blaming others. In response to major life events, reporting more hostile reactions, escapist fantasies, self-blame and wishful thinking prevents an effective cognitive and emotional processing of the event, with the result that individuals are less able to deal with stress (Bolger 1990; Garralda and Rangel 2004).

Coping with stressors in a social environment involves both information and emotion processing related to own and other’s minds. Individuals who use maladaptive coping strategies could have some difficulties with interpersonal relationships. This is evidenced by difficulties in trusting others, exhibiting over-sensitivity in interpersonal interactions, and displaying less assertive behavior during interactions (Heppner and Lee 2002). To the extent that adaptive strategies help individuals to make a better use of internal resources (i.e., psychological processes such as ToM), compared with maladaptive strategies, it is possible that they are related to the capacity to understand others. In other words, adaptive strategies should allow one to face the traumatic event by helping the individual to use more efficiently ToM abilities, whereas the opposite should be true for maladaptive strategies. Although not much research has investigated this hypothesis, there is initial evidence of a relationship between mentalization or related constructs such as emotional competence (Allen et al. 2008) and coping strategies (e.g., Austin et al. 2010; Saklofske et al. 2012). Of particular note is the study by Vannini et al. (2011), which provided initial causal foundation for our hypothesis. The authors conducted a virtual anti-bullying intervention with elementary school children aimed at increasing coping skills for dealing with the phenomenon of bullying. Their results revealed that children exposed to the intervention (and thus, children provided with coping skills to deal with bullying), compared with those in the control group, displayed increased ToM, i.e. greater use of justifications provided for suggesting the use of coping strategies to the victim of bullying. We aim to extend these initial results, by examining the relationship between coping strategies and ToM. More importantly, for the first time we will try to disentangle the effects of various types of coping strategies (i.e., active, avoidant, negative) on ToM. Specifically, we expect that active coping strategies will be associated with increased ability to understand others’ mental states (i.e., ToM), whereas negative coping strategies should have opposite associations with ToM. As for avoidant coping strategies, although they are generally considered maladaptive and should generally produce negative consequences (Foa and Riggs 1993), we expect that they will be positively associated with ToM. Our study was conducted some months after the first earthquake, but only a short time after the earthquakes (weaker, but not less feared by adults and children) ended. Since avoidance strategies have been shown to have beneficial effects in the short-run (Rantanen et al. 2011; Suls and Fletcher 1985; Taylor and Stanton 2007), we think it is likely that they will be positively (instead of negatively) associated with ToM. In turn, in line with research reviewed above, higher ToM should be associated with better cognitive performance (Meichenbaum and Biemiller 1998).

Importantly, we acknowledge the possibility that the association between coping strategies and ToM will be moderated by perceptions of social support. Research has shown that ToM skills are transformed by interpersonal social and family relationships (Fiasse and Nader-Grosbois 2012): being supported by others who are present in the social environment may promote the understanding of one’s own and others’ emotional states, which in turn may have implications for individuals’ responses to stress (Cohen and
Williamson 1991). The role of social support should be especially evident when individuals face the threat posed by the stressful event by trying to escape (i.e., when they use avoidant coping strategies). In the aftermath of a natural disaster, social support should become critical in order to help people who try to react by escaping the reality to remain in touch with the social environment, allowing them to understand others’ mental states (i.e., ToM) and, as a consequence, to face the stressful event more effectively. In other words, we expect a moderated mediation effect, such that avoidant coping strategies should be associated with increased ToM only among those perceiving more social support; in turn, increased ToM should be associated with improved cognitive performance. In particular, we focused on support from peers, which may be better positioned to provide a connection with the social environment where children spend most of their time, that is, at school. We will also test the moderation effect for the other two types of coping strategies (i.e., active and negative), since we cannot exclude that their effects also depend on perceived peer social support.

**The Present Research**

The main goal of this study was to examine coping strategies as predictors of cognitive performance in the aftermath of the earthquake which struck the Emilia Romagna region in May 2012. ToM was examined as the process mediating change in cognitive performance. Peer social support was tested as the boundary condition of the predicted effect. Our hypotheses were tested in a sample of elementary school children a few months after the first quake, but just after the tremors ended.

We focused on three types of coping strategies (active, avoidant and negative) because, as demonstrated by the literature reviewed, they can have distinct effects on psychological functioning and act through different processes. Considering just one type of coping strategy may obscure theoretically important effects.

As the outcome measure we focused on cognitive performance. The choice to investigate cognitive performance and not academic performance, as was done by most of research reviewed, was due to the fact that performance on school tests may be easily affected by cultural differences. Moreover, testing academic performance as the outcome variable was not possible as there were no available standardized tests that we could consider. We decided to use a measure of purely non-verbal reasoning ability (tapping on fluid intelligence), which can have broader relevance for general cognitive processes compared with academic achievement. In any case, we employed a measure of cognitive performance which has been shown to be a good predictor of students’ academic achievement in all school grades, especially among elementary school children (Jensen 1980; Laidra et al. 2007). This measure also allowed us to overcome problems in the performance due to cultural and linguistic issues. Specifically, we used items from the Comprehensive Test of Nonverbal Intelligence (Hammill et al. 1996) and from the Raven’s Standard Progressive Matrices (Raven 1981), which measure intellectual abilities independently of language. There is evidence that performance on similar tests tapping on non-verbal intelligence can be severely impaired following trauma. Specifically, Emdad and Søndergaard (2005) found that those suffering to a greater extent of post-traumatic stress disorder performed more poorly on tests designed to capture short-term memory and general intelligence. Thus, investigating factors associated with cognitive performance as we measured it in this study may provide important indications on protective factors for cognitive functioning among children in the aftermath of a natural disaster.
ToM was tested as the mediating process. Indeed, since ToM and related constructs such as mentalization can be dampened by stressful situations (Cadamuro and Versari 2012; Smeets et al. 2009), we argue that the use of specific coping strategies may influence them. In turn, heightened ToM abilities may help sustaining cognitive performance (Kloo and Perner 2008). This hypothesis is in line with MacIntosh’s (2013) theorizing, proposing that ToM can mediate between childhood trauma experiences and cognitive and emotional functioning. There is initial evidence that mentalization mediates the relationship between traumatic events and cognitive consequences among children (Bateman et al. 2009). Our study goes a step further, by testing a link between how individuals react to a traumatic event (i.e., coping) and a cognitive outcome highly relevant within school contexts (i.e., cognitive performance). In this study, we used classic measures of ToM, intended as the ability to assume the perspective of another person and predict what this person can know (see, e.g., Frith and Frith 2003, 2006).

Finally, we included a measure of peer social support, examined as moderator of coping. However, as argued in the previous paragraph, we expect this variable to only moderate the effect of avoidance coping. Indeed, peer social support should help individuals who deal with the event by attempting to escape from it (i.e., those using to a greater extent avoidance strategies) to stick to reality by maintaining a link with their social environment, thus allowing them to understand others’ mental states (i.e., ToM) and, in turn, to react to the traumatic event more successfully.

Although we are aware that psychological functioning may also include emotional components, we decided to focus exclusively on cognitive performance. We believe cognitive performance is related more to ToM and academic achievement compared with emotional functioning, which may possibly have stronger impact on motivation. Moreover, including a test on emotional functioning would have increased the length of the questionnaire, thus also undermining its general validity.

The tested model is represented in Fig. 1. To recap, hypotheses are the following:

1) coping should be associated with cognitive performance via ToM depending on the type of coping strategy. Specifically, active and avoidant strategies should be positively related with cognitive performance via heightened ToM; negative coping should be negatively associated with cognitive performance via reduced ToM;

2) peer social support should moderate the effect of avoidance coping on ToM, which in turn should be related with higher cognitive performance. Specifically, we expect a moderated mediation effect (Muller et al. 2005; Preacher et al. 2007), such that the positive relation between avoidance coping and cognitive performance via ToM should be significant only among participants reporting higher support from peers.

Support for our hypotheses would help integrating previous research results, by demonstrating on one side the existence of a relationship between coping strategies and ToM and, on the other side, a positive association between ToM and cognitive performance. Moreover, it would demonstrate for the first time the crucial role of peer social support in sustaining the role of avoidant coping in improving, via ToM, cognitive performance.

Methods

Participants and Procedure

Participants were 517 elementary school children (254 males, 263 females) from five elementary schools in the province of Modena. The schools were selected by identifying
areas heavily struck by the earthquake and asking for the schools’ permission to investigate how children responded to the disaster. Prior to conducting the study, we secured consent from the children’s parents, teachers and school heads. This research was conducted in adherence to the legal requirements of the study country and in accordance with APA ethical guidelines.

On the basis of schools’ indications, all third-, fourth-, and fifth-years were included in the final sample. The choice to exclude first- and second-year pupils was due to concerns, shared by schools, that younger children would be unable to attend to all measures we included in the research. Although it was clearly stated that participation was voluntary, we have no information of children who refused to take part to the study or who dropped the investigation during the administration of measures.

Mean age was 9.46 years ($SD = 0.94$, range 7.58–12.75). Research was presented as a study on the consequences of the earthquake. Anonymity and confidentiality of responses was ensured, by also explaining that data would be analyzed in an aggregate and not in an individual way. Approximately 6 months after the two powerful earthquakes of May 2012, participants were administered a series of measures during classes, presented in randomized order: cognitive performance, coping strategies, peer social support (all administered collectively), second-order false beliefs tests (administered individually). Researchers collecting data were students enrolled in educational academic courses at a Northern Italian university. All students-researchers were accurately trained by the first three authors of the present article, with a special focus on how to interact with teachers and pupils, how to present the research and how to administer the various tasks.

Instruments

Coping Strategies

To assess coping strategies, we used the Kidcope scale (Spirito et al. 1988), a widely used instrument, which consists of a checklist designed to assess cognitive, emotional and social coping strategies among children and adolescents (Holen et al. 2012; Vigna et al. 2010; for a review, see Pfefferbaum et al. 2013). The scale is composed of 15 items, each assessing a

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1 The questionnaires included other measures which are not analyzed here.
specific strategy, tackling the use of the following coping strategies: distraction, social withdrawal, wishful thinking, self-criticism, blaming others, problem solving, emotional regulation, cognitive restructuring, social support and resignation. These strategies can be grouped into: active coping strategies (6 items capturing strategies of problem solving, cognitive restructuring, emotional regulation, social support); avoidant coping strategies (7 items, strategies of distraction, social withdrawal, wishful thinking, resignation) and negative coping strategies (2 items, assessing self-criticism and blaming others strategies). Participants were asked to indicate, for each strategy, whether or not they used it in order to deal with the earthquake. Each strategy checked by the child received the score of 1; in case the child did not use the strategy, the score was 0. Higher scores reflect a greater use of active (scores from 0 to 6), avoidant (scores from 0 to 7), or negative (scores from 0 to 2) strategies, respectively.²

ToM Abilities

In order to investigate the capacity to understand not only a person’s perception of a social situation (first-order reasoning), but also different individuals’ concern about the others’ mental states (second-order reasoning), we used two Second-Order False Belief Tasks: the “Birthday Puppy” (Sullivan et al. 1994) and the “Double Bluff” Story (Happe´ 1994). These two tasks have been shown to be reliable and valid measures of ToM (e.g., Hughes et al. 2000). Birthday Puppy is a story about a mother who deliberately misinforms her son about what he will receive for his birthday, because she wants to surprise him. Unbeknownst to his mother, the child actually discovers the true birthday present. Later, when speaking to the child’s grandmother, the mother is asked whether the child knows what he is getting for his birthday (second-order ignorance), and then what the child thinks he is getting (second-order belief). Each participant had to answer six questions, and was assigned 1 point for each correct answer. The final possible score ranges from 0 to 6, with higher scores reflecting greater ToM abilities. The Double Bluff Story is based on the vignettes from the “Strange Stories,” consisting of simple account of events, which concern the different motivations that can lie behind everyday utterances that are not literally true. The story tells about a prisoner, member of the Blue army, captured by the Red army. The prisoner wants to save his army and the child is asked what the prisoner has to say to deceive the Red army. The child had to answer three questions; scores in this case range from 0 to 3, with higher scores associated with higher ToM abilities. Scores from the two Second-Order False Belief Tasks (r = .19, p < .001) were summed to provide one composite ToM score for each child as these tasks have been found to tap a common underlying cognitive capacity (Perner 1991); previous studies have found performances on these specific tasks to be strongly associated among children (e.g. Astington and Jenkins 1999; Hughes and Dunn 1998; Schacht et al. 2013). Moreover, considering two tasks gives us the possibility to use a multi-item measure of ToM, thus increasing the validity and predictive value of our composite measure. Since the range of scores for the two tests was different, scores were transformed into z-points before being summed.

² The Kidcope checklist is a screening measure tackling the use of various specific coping strategies with a yes–no format. As such, Cronbach alpha is often not computed (see, e.g., Jeney-Gammon et al. 1993; Paardekooper et al. 1999; Pereda et al. 2009; Piazza-Waggoner et al. 2008).
Cognitive Performance

Each participant was administered a test of logical-formal reasoning (set of figures to be completed), consisting of 15 items for the third- and fourth-grade and 20 items for the fifth-grade. Items were extracted from the Comprehensive Test of Nonverbal Intelligence (Hammill et al. 1996), and from the Raven’s Standard Progressive Matrices (Raven 1981), designed to measure those intellectual abilities that exist independently of language. Each item correctly responded to received a score of 1; items incorrectly responded to were assigned a score of 0. In order to use the measure of cognitive performance as dependent variable, since the range of possible scores of third- and fourth-grade (ranging from 0 to 15) differed from that of fifth-grade (ranging from 0 to 20), all scores were transformed into z-points.

Peer Social Support

The following item was used: “Did your friends help you to recover from the earthquake?”. The 4-step response scale ranged from 1 (absolutely not) to 4 (absolutely yes).

Results

Preliminary Analyses

Data were preliminarily inspected for outliers. No univariate or multivariate outliers were detected. Following Schafer and Graham’s (2002) recommendations, maximum likelihood imputation (Expectation–Maximization algorithm) with PRELIS (LISREL 8.7) was used to estimate values for missing scores.

Means, standard deviations and correlations for the various measures are presented in Table 1, in which z-transformed scores for cognitive performance (M = 10.56, SD = 3.26, for third- and fourth-grade, and M = 13.49, SD = 3.92, for fifth-grade) and the overall score of ToM abilities (computed as the sum of z-transformed scores on Birthday Puppy

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| 1. Active coping | – | | | | |
| 2. Avoidance coping | .42*** | – | | | |
| 3. Negative coping | .15*** | .02 | – | | |
| 4. ToM abilities | .13** | .10* | –.07† | – | |
| 5. Peer social support | .15*** | .11* | .03 | .04 | – |
| 6. Cognitive performance | .05 | .14*** | –.05 | .28*** | –.03 | – |
| M | 4.35 | 5.03 | 0.32 | 0.00 | 3.06 | 0.00 |
| SD | 1.22 | 1.33 | 0.54 | 0.77 | 0.95 | 1.00 |

Response scale ranges were: 0–6 for active coping; 0–7 for avoidance coping; 0–2 for negative coping; 1–4 for peer social support. For ToM abilities and cognitive performance, we computed standardized scores separately for third-, fourth- and fifth-graders; untransformed scores, separately for school grades, are reported in the main text.

† p ≤ .10, * p < .05, ** p < .01, *** p ≤ .001
Story and Double Bluff Story) are presented. Mean scores for the two false belief tests were: $M = 3.11$ ($SD = 1.19$) for the Birthday Puppy Story, and $M = 0.62$ ($SD = 0.89$) for the Double Bluff Story, respectively.

As shown in Table 1, active coping was positively associated with both avoidance and negative coping, suggesting that participants trying to cope more actively with the traumatic event were also those using to a greater extent the other coping strategies. In line with expectations, all types of coping strategies were related to ToM ability. Specifically, active and avoidant coping strategies were positively associated with ToM abilities, whereas the relation between negative coping strategies and ToM abilities was negative (marginal effect). Finally, as expected, ToM abilities were positively associated with better cognitive performance.

Main Analyses

To test our hypotheses, hierarchical regression was applied. Results are shown in Table 2. First, we tested whether coping strategies affected ToM abilities, and whether this effect was moderated by peer social support. In the first step we entered the three (centered) types of coping strategies (active, avoidant, negative) and peer social support (centered). In the second step, we added the two-way interactions between each type of coping strategy and peer social support. In all analyses, age and sex were controlled for. ToM ability served as dependent variable. Consistent with our first hypothesis, the analysis revealed a main effect of active coping strategies, which were positively associated with ToM abilities, and a main effect of negative coping strategies, which were negatively associated with ToM abilities.

Moreover, the expected interaction between avoidant coping strategies and peer social support was significant. In line with Hypothesis 2, simple slope analysis showed that avoidant coping strategies were positively associated with ToM abilities when participants experienced higher social support from their peers ($+1 SD$), $b = .10$, $t = 2.13$, $p < .05$, whereas the relation between avoidant coping strategies and ToM abilities was nonsignificant for lower levels of perceived peer social support ($-1 SD$), $b = -.03$, $t = 0.32$.

In order to examine whether ToM abilities (mediator) were associated with cognitive performance (dependent variable) while controlling for the effects of coping strategies (independent variables), we conducted a regression identical to that used above. In this case, however, ToM ability was included as a further predictor (see Table 2). Cognitive performance was the dependent variable. Results showed a main effect of avoidance coping, which was positively associated with cognitive performance. Also a marginal effect of gender was found, indicating that females had better cognitive performances than males. More relevant to our hypotheses, the association between ToM abilities and cognitive performance was statistically reliable (Fig. 2).

To test whether the indirect effect was significant, bootstrapping analyses (1,000 resamples) were conducted by using the SPSS macros provided by Hayes (2012). With bootstrapping procedures, a 95 % CI is computed around the path from the predictor to the criterion variable through the mediator. An indirect effect is significant when 0 is excluded from the 95 % CI, $p < .05$. Results showed that, supporting Hypothesis 1, coping strategies affected cognitive performance via ToM. Specifically, when considering active coping as the predictor, the confidence interval was comprised between .007 and .053, indicating that the indirect effect was significant, $p < .05$. When using negative coping as the predictor, the fact that 0 was not included in the CI (ranging from $-.096$ to $-.008$) indicates that the indirect effect of negative coping strategies on cognitive performance via ToM abilities
Table 2 Hierarchical regressions testing the effects of coping strategies and peer social support on ToM abilities and cognitive performance (N = 517)

| Dependent variable | Step 1 | Step 2 |
|--------------------|--------|--------|
|                    | ToM abilities | Cognitive performance | ToM abilities | Cognitive performance |
| Avoidance coping   | .05     | .14**  | .06     | .14**  |
| Active coping      | .13**   | -.04   | .12*    | -.03   |
| Negative coping    | -.10*   | -.03   | -.10*   | -.03   |
| Peer social support| .01     | -.06   | .03     | -.05   |
| ToM abilities      | -       | .27*** | -       | .27*** |
| Age                | -.02    | .05    | -.02    | .04    |
| Gender (1 = males, 2 = females) | .03 | .08† | .03 | .07† |
| Avoidance coping × peer support | - | - | .12* | .01 |
| Active coping × peer support | - | - | -.02 | .08† |
| Negative coping × peer support | - | - | -.01 | -.01 |
| $R^2$              | .03     | .11    | .04     | .10    |
| $F$                | 2.69*   | 8.55**** | 2.52** | 6.42*** |
| $df$               | (6,510) | (7,509) | (9,507) | (10,506) |
| $F_{change}$       | -       | -      | 2.13†   | 1.40   |
| $df_{change}$      | -       | -      | (3,507) | (3,506) |

† p < .10, * p < .05, ** p ≤ .01, *** p ≤ .001
was significant, $p < .05$. Finally, when the interaction between avoidance coping and peer social support was used as the predictor, the confidence interval ranged from .006 to .042. Thus, providing support for Hypothesis 2, the expected moderated mediation effect was significant, $p < .05$ (for a similar procedure for testing moderated mediation, see, e.g., Abrams et al. 2008; Johnson et al. 2008).3,4

**Discussion**

We conducted a study with the aim of testing whether coping strategies are an effective means of dealing with an earthquake by promoting better cognitive performance among elementary school children. Specifically, we were interested in assessing the differential effects played by different types of coping strategies. Our key variable was represented by ToM abilities, which should explain the association between coping strategies and cognitive performance. We also tested peer social support as a potential moderator of coping strategies. Hypotheses were tested on a sample of 517 elementary school children in Northern Italy in the aftermath of a terrible series of earthquakes that struck the Emilia-Romagna region in 2012.

First of all, results revealed that participants made larger use of both active and avoidant rather than of negative coping strategies. These strategies were associated with greater ToM abilities that, in turn, were related to a better cognitive performance. Importantly, the indirect effect of avoidant coping strategies crucially depended on peer social support. Specifically, avoidant coping strategies were associated with greater ToM abilities, and in turn with improved cognitive performance, only among children who experienced more

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3 Even though the lower bound of a bootstrap confidence interval is close to zero, an indirect effect is regarded significant at $p < .05$ if the confidence interval excludes zero, independently from how close lower or upper bounds are to zero (see, e.g., Shrout and Bolger 2002).

4 Regression analyses were replicated controlling for the effects of grade and school of belonging by using the cluster option in PROCESS (Hayes 2012). Results were virtually identical, except for the mediation effect involving negative coping as predictor, which was nonsignificant when controlling for school of belonging. This weaker effect of negative coping might be partly due to the limited range of responses (0–2) provided by the measure used in this study. The reduced variability might have limited the predictive value of this variable. Future studies should verify this possibility.
social support from their peers. Interestingly, avoidant coping strategies also had a direct unmediated effect on improved cognitive performance. Finally negative coping strategies were negatively associated with cognitive performance via impaired children’s ToM ability.

On a theoretical level, our findings are in line with previous literature, by showing that qualitatively different types of coping strategies following a highly traumatic event have differential effects on psychological functioning (i.e., ToM and cognitive performance). In particular, active coping strategies had positive associations with cognitive performance, whereas negative coping strategies were negatively associated with participants’ performance in the cognitive test we employed (Garralda and Rangel 2004; Peklaj and Puklek 2001; Schaefer and Moos 1998). The finding that avoidance strategies had positive direct and indirect associations with cognitive performance may be explained by the fact that, being defensive strategies that allow to manage the distress following the traumatic experience, they can have adaptive effects in the short-term (e.g., Taylor and Stanton 2007). Indeed, although data were collected approximately 6 months after the first earthquake, the tremors did not stop immediately and persisted, although with much less intensity, until a short time before data collection. Our results thus replicate and extend previous findings, by showing that avoidance strategies following a traumatic event also have beneficial associations in the short-run when child samples are taken into account. However, we acknowledge that, in the long run, avoidant coping strategies may be less relevant for sustaining cognitive performance and may even be detrimental to it (MacCann et al. 2011).

Our findings concerning avoidant coping are especially interesting when considered in light of results by Weems and Graham (2014). The authors examined a sample of young children after exposure to Hurricane Katrina (24 and 30 months after the event) and Gustav (1 month after the event) and identified a cluster of participants with stable low post-traumatic stress symptoms across the two traumatic events. Within this cluster, a portion of children was identified as truly resilient (stable low symptoms associated with high exposure to the traumatic event), in contrast with other two subgroups, “stable low” (low symptoms and low exposure) and “chronic” (stable high symptoms). Results revealed that the use of avoidance coping was significantly lower within the resilient subgroup compared with the stable low and chronic subgroups. More specifically, avoidance coping was associated with lower stress symptoms among non-resilient individuals, or among individuals who had low exposure to the event, whereas it “non-use” was associated with lower symptoms among resilient participants. In light of these results, it is possible that truly resilient children of our sample characterized by high disaster exposure and low stress symptoms may have made less use of avoidant strategies and/or benefitted less of the use of avoidant strategies compared with the other children. In line with Weems and Graham’s reasoning, this subgroup of children may have a unique coping style and react qualitatively differently to a traumatic event compared with other children. In other words, our results may obscure important differences among subsamples of children, thus suggesting caution in the generalization and interpretation of results. Future studies should consider more carefully distinctions among subsamples of children and test the effects of coping strategies separately for children differing in levels of resilience in response to a traumatic event.

ToM ability emerged as an important factor associated with better cognitive performance. Previous studies suggested that ToM in the face of trauma helps to deal with psychiatric disorders (Allen et al. 2008) and is related to better cognitive performances such as academic achievement (e.g., Blair and Razza 2007; Lecce et al. 2011). There is also evidence that the ability to mentalize others’ mental states may suffer as a
consequence of traumatic events (e.g., Mazza et al. 2012; Sharp et al. 2012), so that ToM abilities may be seriously dampened by the psychological consequences of the natural disaster (Cadamuro and Versari 2012). Our findings suggest that coping strategies are important factors to be considered as they are associated with more efficient ToM processes. In particular, active and avoidant coping strategies were related to children’s increased ToM abilities, which in turn were associated with better cognitive performance. Moreover, our findings help illuminate the negative association between negative strategies and cognitive functioning. Specifically, negative strategies were associated with worse ToM abilities, which in turn were related with decreased cognitive performance. The present results extend previous research showing that ToM processes (and constructs related to them) are associated with coping strategies (e.g., Saklofske et al. 2012), by demonstrating that coping strategies are associated with stronger ToM processes which, in turn, are positively associated with cognitive performance. However, since data are correlational, we acknowledge that the relation between coping strategies and ToM processes could be bi-directional. Future studies are needed in order to better understand the causal relation between the two types of constructs.

Another relevant finding concerns moderation by peer social support. As predicted, a moderated mediation effect emerged, such that avoidant coping strategies were positively associated with ToM abilities only among those who perceived a stronger social support from their peers. In turn, ToM abilities were associated with improved cognitive performance. Individuals who try to escape the traumatic event (by using avoidance strategies) are likely to distance themselves from the reality, thus also losing grip with their social environment and, as a consequence, risking deficits in understanding others (i.e., deficits in ToM abilities). In such cases, the perception of being supported by peers may be especially beneficial, because individuals may benefit from avoidant coping strategies (which allow them to distance themselves from the distress) by restoring the ability to understand others (who are perceived as supportive and close to them). In line with this reasoning, avoidance strategies were related to increased ToM abilities only among those who were helped by peers to deal with the earthquake and who as a consequence were psychologically less distant from their social environment. On the other hand, using active coping strategies implies a closer connection with the social environment, so perceived social support should matter less to these individuals. As for negative strategies, they reflect active distancing from others, so it is not relevant whether these others are more or less supportive.

Notably, peer social support did not moderate the effect of avoidant coping strategies on cognitive performance. Thus, avoidant coping strategies in the short-run may also have beneficial unmediated associations with cognitive performance in the aftermath of a natural disaster.

It is worth noting that our results are not only in line with, but also considerably extend previous literature. In particular, the present findings integrate previous studies showing effects of coping strategies on ToM, on one side, and positive association between ToM and cognitive performance, on the other side. Importantly, we demonstrate that different types of coping strategies are differently associated with ToM, also depending on the support received from the social environment (in our case, from peers). Furthermore, our results extend literature on the relationship between ToM and cognitive performance, by adding to studies showing that ToM affects academic achievement. In particular, we demonstrated that ToM is associated with a more general measure of cognitive performance (which has been found to be predictive of academic achievement; see Jensen 1980; Laidra et al. 2007) related to non-verbal intelligence.
Our findings have noteworthy practical implications. Practitioners should pay attention to how children deal with a negative event such as an earthquake and to the coping strategies they use. In particular, they should conduct a preliminary analysis and test which coping strategies are more adaptive in the specific context. Our study demonstrates that also avoidant, in addition to active coping strategies, can be positively associated with cognitive performance, also depending on the level of social support. Practitioners could then run training development courses based on the most adaptive coping strategies, in order to foster their adoption and use among children. One possibility, in line with our findings, is to work on active coping, for instance reasoning with children about the importance of searching for available solutions, talking with others and seeking their support. Moreover, they should monitor children’s ToM abilities, trying to reinforce them also by taking advantage of a greater use of active and avoidant coping strategies. In fact, ToM abilities are an important factor which is associated with improved cognitive performance and, presumably, with academic performance.

We acknowledge some limitations. First, data are correlational, so we cannot draw causal inferences. Indeed, it is also possible that intelligence as measured by cognitive performance influenced ToM and the use of specific coping strategies. Future studies adopting experimental or longitudinal design may help clarify the direction of causality among the variables considered in the present research. An additional limitation concerns our measure of social support, which consisted of a single item; future studies should use multi-item measures of social support in order to provide stronger validity to the present results. Furthermore, we did not test moderation by social support from family. Although social support from peers moderated the effects of coping strategies in the expected direction, it is possible that results are different when considering other sources of social support. Another problematic aspect concerns the fact that children may have suffered differential exposure to the earthquake. For instance, they may have suffered losses among family members, or significant adults may have been injured. It is likely that differential exposure to trauma would have affected children’s responses to the earthquake. Unfortunately we do not have access to this information. Future studies should consider how differential exposure to the traumatic event affected the way children responded to it. Another relevant limitation is that in our study we did not consider the effects of PTSD. Since the extent of stress symptoms may seriously affect cognitive performance, e.g. in the form of academic achievement (Weems et al. 2013), future studies should necessarily test the role of PTSD in conjunction with that of coping strategies, ToM and cognitive performance. Finally, we used specific tasks to assess cognitive performance and ToM. Future studies could add external validity to the present results, by considering additional tests of cognitive performance (e.g., based on verbal intelligence or on academic achievement) and further tests of ToM.

In conclusion, our study suggests that coping strategies are crucial factors to consider in order to face the negative effect of a natural disaster such as an earthquake, and that ToM abilities play a relevant role in explaining their associations. These findings can be of capital use to theorists and practitioners interested in how young children deal with a trauma after experiencing a devastating earthquake.

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