

Adolescents' Mental Health Outcomes According to Different Types of Exposure to Ongoing Terror Attacks

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Abstract This study investigates the impact of several types of exposure to terror attacks on adolescents' psychological outcomes in the context of ongoing terror. A total of 913 adolescents (51% girls) aged 12 to 18 years (12–13.6 = 33%; 13.7–15.6 = 38%; 15.7–18 = 28%) took part in the study. Detailed data were collected concerning objective, subjective and “mixed” types of exposure to terror, as well as demographics, post-traumatic stress symptoms (PTSS), emotional and behavioral problems and overall psychological and psychiatric difficulties. Subjective exposure was found to be the most important contributor to adolescents' post-traumatic stress and other mental health problems in this context. Gender also had important effects. The effects of objective and mixed types of exposure, as well as age, were less prominent. We did find, however, that the more adolescents consulted media, the *less* they experienced behavioral and emotional problems. Given that subjective experiences appear to be the best factor in explaining mental health outcomes when adolescents are confronted with persistent terror, the cognitive and emotional dynamics along with the coping behavior linked to such experiences merit further investigation.

Keywords Terror · Adolescents · Exposure · Cognitions · Emotions · Mental health · Post traumatic stress

Introduction

In recent years, the worldwide risks of exposure to terror attacks have stimulated research into ways in which individuals adjust to these potentially traumatizing events. The effects of persistent exposure to terror attacks on young people merits special attention given their developmental status and potential vulnerability (Joshi and O'Donnell 2003; Wooding and Raphael 2004). In the present study, we seek to gain insight into how different types of exposure to ongoing terror relate to adolescents' mental health outcomes. To that end, we first critically review the findings as they pertain to different types of exposure. We then consider the operational limitations of this concept, along with the role of major relevant demographic factors such as gender and age. We then present the results of our empirical study.

Ongoing Exposure to Terror: The Case of Israeli Adolescents

Since the outbreak of the al-Aqsa Intifada in late September 2000, Israeli society has been confronted with a wave of terror attacks, including drive-by shootings, break-ins and suicide bombings. Prior to the present study, many children and adolescents had witnessed this type of attack directly or indirectly. This raised questions as to the psychological effects of these ongoing experiences. While exposure to terror is known to increase the risk of both short-term (e.g. post-traumatic stress symptoms or

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disorder, “PTSS” or “PTSD”) and long-term emotional and behavioral problems, the research conducted so far has often yielded inconclusive findings as regards the range, intensity and types of outcomes. In particular, to date, exposure per se remains differently operationalized. It therefore appeared that a closer analysis of the conceptualization and operationalization of this phenomenon across the literature was necessary. To guide this analysis, the findings are grouped according to three types of exposure (objective, subjective and “mixed” exposure), and we discuss the rationale for this classification.

The Role of Objective Exposure

It is generally assumed that *direct, physical exposure* to terror attacks constitutes a primary factor determining young people’s subsequent PTSS and emotional and behavioral problems. Several studies have demonstrated that higher levels of physical exposure to terror attacks (as regards number or intensity) elicit more adverse psychological reactions, such as higher rates of PTSD, anxiety, functional impairments and substance abuse (e.g. Hoven et al. 2002; Koplewicz et al. 2002; Laufer and Solomon 2003; Schiff et al. 2007). However, this type of exposure appears to explain only a limited degree of variance in young people’s mental health outcomes (usually <10%; Schiff 2005). Furthermore, the link between physical exposure and psychological outcomes appears to be counter-intuitive in some cases, with a number of studies indicating fewer negative outcomes despite higher direct exposure or more negative outcomes after other forms of exposure, such as indirect exposure, near-miss experiences or exposure through the media (Aber et al. 2004; Pat Horenczyk 2003; Pfefferbaum et al. 2001).

Additionally, research has focused on exposure through its *relationship with a victim* (also referred to as indirect, interpersonal or family exposure). Knowing a victim of a terror attack has been postulated to be a special risk factor for children or adolescents because their developmental status may render them more vulnerable to the loss of loved ones (Pynoos and Eth 1985). Outcome studies on both single and ongoing attacks indeed show that youngsters who knew a terror victim experience more PTSD and stress-related symptoms than those who did not. According to these studies, more severe mental health outcomes result from closer relationships with victims (Hoven et al. 2002; Pat Horenczyk and Doppelt 2005; Pfefferbaum et al. 1999a, b, 2003; Ronen et al. 2003; Solomon et al. 2005). Nevertheless, some findings suggest the need to differentiate the effects of relational exposure according to the type of outcome. For example, Hoven et al. (2004) found no association between the likelihood of Separation Anxiety

Disorder (SAD) or the number of SAD symptoms and whether or not youngsters had a family member who was exposed or injured during the September 11 attacks. Regardless, these studies show the potential importance of examining the nature and effects of personal relationships.

Taken together, direct physical exposure and exposure through a relationship with a victim of a terror attack can be conceived of as objective, since this type of experience cannot be controlled by the individual and is independently observable by third parties. While objective exposure to terror is more or less consistently associated with adverse mental health outcomes, its inherent impact appears to account for these outcomes only to a limited extent. This limited explanation suggests the need to consider other factors.

The Role of Subjective Exposure

Interestingly, subjective experiences of exposure to terror attacks have been the subject of relatively little investigation; only about one fifth of overall research in this field addresses this perspective. Studies investigating single terror attacks tend to provide support for the assumption that subjective exposure—or the cognitive and emotional experiences that occur when a person undergoes an attack—is a significant predictor of subsequent PTSD. This was the finding, for example, of studies exploring the reports of peri-traumatic reactions (i.e. initial fears) and worries for the safety of family members and friends in the wake of the Oklahoma City and Nairobi bombings (Pfefferbaum et al. 2002, 2003).

When investigated in the context of ongoing terror, the impact of subjective exposure appears to vary depending on how it is operationalized. For example, levels of self-reported fear increased with the number of objective events for youngsters living in more exposed areas during the Intifada (Laufer and Solomon 2003; Solomon and Lavi 2005; Solomon et al. 2005). This association changed, however, when a different analysis was adopted that considered the average sense of fear. Adolescents with less objective exposure to terrorist acts then appeared on average to experience a higher sense of fear (Solomon et al. 2005).

Thus, while in some studies objective and subjective dimensions tend to be positively interrelated (i.e. increased physical exposure triggers an increased sense of fear), this is not systematically the case. More specifically, there appears to be some evidence that subjective exposure may act as a significant (independent) predictor of adolescents’ mental health outcomes. These findings point to the need to investigate in more detail the relative roles of the subjective and objective dimensions of exposure.

Mixed Types of Exposure

Some studies also have investigated other types of so-called indirect exposure, such as near-miss experiences or exposure through the media. The interpretation of these findings is complicated by differences in focus across studies. While some consider exposure via a relationship with a victim as indirect exposure (Pfefferbaum et al. 2001), others include media exposure in this construct (Aber et al. 2004; Lengua et al. 2005) and yet others near-miss experiences (Pat Horenczyk 2003, 2005). For example, a study by Pat Horenczyk (2003) investigated the role of *near-miss experiences* (such as “missing the bus that later exploded”) in a comparison of mental health outcomes in adolescents from the Gush Ezion-West Bank area and Jerusalem. Although the youngsters in Jerusalem were less physically exposed and knew fewer people who had been injured in terror attacks, they reported more PTSD symptoms, overall distress and malfunctioning in the domains of family functioning and risk-taking behavior. Reports of indirect exposure by these youths, more specifically near-miss experiences, were put forward as a possible explanation for this outcome. *Media exposure*, in turn, has mainly been investigated in the context of single attacks (e.g. Aber et al. 2004; Fremont et al. 2005; Lengua et al. 2005; Pfefferbaum et al. 2001). These studies provide evidence that even those who were never physically exposed in a direct way or who do not know anyone who was injured in a terror attack are still psychologically at risk through exposure to the media. For example, a study of the Oklahoma City bombing showed that media exposure in the wake of the attack significantly contributed to post-traumatic stress symptoms even in those who were not directly exposed (Pfefferbaum et al. 2001). In addition, a longitudinal investigation (Aber et al. 2004) revealed that while neither physical nor family exposure predicted any changes in adolescents’ mental health after the September 11 attacks, indirect exposure through the media did predict an increase in post-traumatic stress symptoms. Thus, although media exposure has apparently not been investigated in the context of ongoing exposure to terror, the above findings suggest that this component may in itself affect how young people make psychological adjustments following terror attacks.

In sum, the diversity of ways in which studies conceptualize exposure has tended to complicate the interpretation of the impact of exposure on adolescents’ mental health. Inconsistent results across studies may therefore relate at least partially to different aspects, definitions and measurements of exposure. Moreover, little attention has been paid to the way in which persistent exposure to terror differs from single attack occurrences. In order to investigate the effects of ongoing exposure to terror, we must address how this differs from single attack occurrences.

The Specificity of Ongoing Exposure

Persistent exposure to terror is expected to differ from one-time occurrences in several ways. Foremost, single and ongoing exposures are fundamentally different due to the cumulative effects that specifically pertain to the latter (e.g. Rosenberg et al. 2008; Zeidner 2005). Indeed, ongoing terror generally involves higher levels of objective exposure. The cumulative negative effects on adolescents’ mental health of exposure to a larger number of attacks are easily understandable. However, exposure over a longer period to (possible) terror occurrences may also affect young people’s perceptions of risk or feelings of insecurity, defined here as subjective exposure. Especially in the case of youngsters, persistent exposure to potentially traumatizing events may carry critical mental health implications during periods of identity formation and life perspective development. The neuroscientific database underscores the importance of cognitive control and emotional regulation processes for understanding mental health adjustments in the broader framework of trauma. The developmental psychopathology literature shows that these processes tend to be affected by dose-response effects in relation to the persistence of perceived threat and insecurity (e.g. Celestin and Celestin-Westreich 2008; Celestin-Westreich and Celestin 2008b, in press; Celestin-Westreich et al. 2007; Joshi and O’Donnell 2003; Laufer and Solomon 2003; Taylor and Liberzon 2007; Tull et al. 2007; Wooding and Raphael 2004; Zeidner 2005). The potential effects of the cumulative and subjective aspects of exposure therefore appear to merit special attention when considering adolescents’ adjustments in a context of recurrent terror attacks.

The Role of Gender and Age

In addition to variables directly pertaining to the exposure per se, the moderating role of demographics such as gender and age on youngsters’ psychological outcomes is often investigated. Most studies confirm the importance of gender, as girls generally report more PTSS and internalizing difficulties compared to boys who report more externalizing problems and risk-taking behavior (Hoven et al. 2002, 2004; Pat-Horenczyk et al. 2007; Pat Horenczyk 2003; Pfefferbaum et al. 1999a, b, 2001, 2003; Sever et al. 2008). The research also tends to find that age moderates the extent of stress reactions in the wake of terror attacks. Younger children appear to exhibit more severe psychopathology such as PTSS, somatic complaints, depression and distress than older children or adolescents (Hoven et al. 2002, 2004; Pat Horenczyk 2005; Solomon et al. 2005). However, the effects of age remain unclear. For

example, Solomon et al. (2005) examined two different samples with similar socio-demographic characteristics, the first at the start of the Intifada and the second one year later. Although the second sample followed the expected pattern outlined above, no significant age effects were found regarding PTSD in the earlier sample. Thus, gender and age are both important factors when it comes to investigating terror-related psychological outcomes in adolescents. In this regard, gender may be a stronger or more consistent predictor of youngsters' mental health outcomes when they are faced with ongoing terror than age, the effects of which call for further clarification.

Implications for the Present Research

Taking into account the above discussion, several limitations emerge from the existing literature on adolescents' exposure to ongoing terror. First, with studies of single attacks still outnumbering investigations of ongoing attacks or risks of attacks, the conceptualization of the pathways that are specific to the effects of the latter is still in its infancy (e.g. Butler 2007; Rosenberg et al. 2008). Second, most research to date has focused on the levels of objective exposure to a terror attack to account for adolescents' psychological outcomes. Other types of exposure, including subjective exposure, near-miss experiences and media exposure, have been investigated less in spite of theoretical and empirical evidence of their importance in the broader trauma literature. Exposure through the media also tends to be narrowly operationalized (e.g. limited to TV watching; e.g. Aber et al. 2004; Pfefferbaum et al. 1999a, b, 2001). Third, an important caveat that emerges throughout the empirical literature is that similar terms appear to cover different contents of exposure. For example, while some studies focus primarily on (direct) physical exposure, such as being present at or near the site of the attack, when investigating the more objective components of exposure to terror, others include relational exposure such as knowing someone who was killed or injured in an attack. Relational exposure is also often referred to as indirect exposure, while media exposure has also to varying degrees been included in this term or sometimes considered as no exposure. Research has yet to address these three central limitations.

Taken together, the literature on the differential effects of exposure components on adolescents' mental health is inconclusive. To date, explicit arguments for the classification of exposure components appear to have received little attention. Consequently, the multidimensionality of the exposure concept also has remained a fairly implicit assumption, while a growing body of research is emerging on post-traumatic resilience building after prolonged

exposure to terror (see, for example, Butler 2007). This suggests that we would gain clearer insight into these issues by seeking to address the multidimensional conceptualization of exposure to terror and encompassing the full range of its components in the research.

To this end, our study focused on the relative impact of different exposure components, over a range of mental health outcomes in the context of ongoing terror. Given the working assumption that it remains to be clarified to what extent the different aspects of exposure, as a multidimensional concept, independently or otherwise affect young people's psychological outcomes, it became an additional research goal to provide a more explicit and systematized conceptualization and operationalization of these components. Thus, events described in the literature as direct physical exposure and (indirect exposure through) a relationship with a victim can be considered as *objective exposure*, because these experiences are observable facts that cannot be controlled by the individual. In contrast, *subjective exposure*, defined here as feelings and/or thoughts of endangerment at the time of the terror event, may result not only from objective exposure but also from an ongoing risk of attacks. Individual or idiosyncratic characteristics, including temperament and cognitive and emotional regulation processes, are likely to help shape these subjective experiences, possibly in a way that is relatively independent of the objective levels of exposure. Taking into account these definitions, both media exposure and near-miss experiences remain separate components of *mixed exposure*, since they include characteristics of both objective and subjective exposure. For example, consulting the media involves a degree of objective exposure (e.g. watching real images of terror attacks). However, whether an adolescent consults the media and to what extent will depend at least partly on individual inclinations (actions that can be personally avoided or controlled).

Given these specifications, the following study hypotheses were formulated. First, taking into account the aforementioned multidimensional perspective on persistent exposure, we needed to examine to what extent the types of exposure that were set forward effectively could be considered distinct entities. Second, we predicted that both objective and subjective exposure would be significantly linked to adverse psychological outcomes more than would be media exposure and near-miss experiences. Third, we expected girls, compared to boys, to express more post-traumatic stress symptoms, emotional and behavioral problems and psychiatric symptoms when confronted with persistent exposure to terror. Younger adolescents also were hypothesized to report more overall mental health difficulties compared to older teenagers. Lastly, we did not make predictions regarding the relative significance of factors in predicting mental health outcomes, but we

conducted regression analyses to assess the relative predictive power of the different exposure components, along with gender and age, on adolescents' mental health outcomes in the context of ongoing exposure.

Method

Participants

This study was based on a sample of 913 Israeli adolescents aged 12 to 18 years ($M = 14.45$; $SD = 1.27$; 49% boys). Students were distributed quite evenly across age groups (12–13.6 = 33%; 13.7–15.6 = 38%; 15.7–18 = 28%). No inclusion or exclusion criteria were applied other than age and availability at the time of testing. Socio-economic status (SES) was determined based on parental wages according to the classification system of the Israeli Ministry's Central Bureau of Statistics. According to this classification, our sample included 53% of students with an average SES, 26% with a low and 13% with a high SES.

The participants attended four schools at four locations in Israel. Three of these (Central Israel, Southern Israel and Jordan Valley) belong to the same educational subsystem (i.e. the Department of Rural Education), which is the only subsystem with schools scattered throughout Israel. These schools are located in suburbs or in rural areas, with students living in kibbutzim (collective farms or settlements), moshavim (cooperative settlements of small individual farms), community villages or small towns. The Jerusalem school serves various neighborhoods of the city and nearby small towns. All the participating schools were open-access (i.e. with no selective admission procedures). At the Jordan Valley School, the entire age-relevant population participated in the study. For the other schools, all the classes that were available at the time of the research participated. Participants were distributed quite evenly across the locations, with 27% attending the Central Israel school, 25% the South Israel, 20% the Jordan Valley and 28% the Jerusalem school.

Procedure

All the ethical procedures applicable to this study were followed. As required by the Israeli Ministry of Education, the offices of the Central Scientist and of the Counseling and Psychological Services reviewed the research proposal and questionnaires before the start of the study. Then, after meeting all the requirements set by the Ministry of Education and receiving its approval to proceed with the study, we received permission from the principals to enter the schools. Students completed the self-report questionnaires during regular classes in September 2003. The participants were informed that the researcher was interested in their

experience of ongoing terror attacks, that participation was voluntary and anonymous, and that they were free to withdraw their participation for any reason and at any time during the questionnaire procedure. Completion time ranged from 25 to 45 min. Few students (i.e. 20 or <2%) chose not to participate or withdrew before completing all of their questionnaires. Many participants expressed enthusiasm while completing the questionnaires, mentioning that they were glad to have an opportunity to share their experiences. All the data were handled anonymously.

Variables and Measures

Participants completed a standardized battery that included the following questionnaires aimed at examining the initial hypotheses.

Demographics

Demographics were assessed by a self-designed demographic inventory that included questions regarding gender, age, class, school, place of residence and parental work.

Exposure to Terror

Since the principal aim of this study was to gain detailed insight into participants' experiences of exposure, these were assessed using a comprehensive "Exposure to Terror and Post-Traumatic Stress Questionnaire" specifically designed for this study. The questionnaire consists of five parts. The first four parts each represented a type of exposure, starting with objective exposure and working toward subjective exposure. The fifth and final part of this questionnaire formally assessed participants' post-traumatic stress symptoms (see below). For data analysis purposes, the items of each part were subsequently used as indexes, as outlined below.

Objective Exposure

Objective exposure to terror was assessed by the "Global Objective Exposure Index" that included two sets of items: on physical exposure and relationship exposure. The former (physical exposure) investigated the number of attacks experienced, geographical location relative to the attack scene and the time elapsed since the attack (at the time of the study). The latter (relationship exposure) involved asking the number of victims known to the participant, the severity and type of their injury and the relationship of the participant with each victim. To strike a balance between information gathering and time constraints, the questions were organized in a skip structure. For example, for each yes answer to "Was anybody you know injured?" the

participant also had to circle each option that applied (from parents through other relatives, friends and neighbors to others) and specify the severity of the injury. The items were presented in nominal, ordinal and interval formats depending on the type of information. For example, participants indicated the time of the attack by choosing between *in the past week*, *in the past month*, *in the past year* and so on. Similarly, they indicated their location relative to the attack scene by choosing between ordinal options such as “I was at the scene among the injured”; “I didn’t see the scene of the attack but I felt/heard the explosion”; etc.

Subjective Exposure

Subjective exposure to terror was assessed through the “Subjective Exposure Index” that consisted of four items, three of which tapped the perceived danger for self, family and friends at the time of the attack (e.g. “Did you feel that you/your family/your friends were in danger?”), while the fourth concerned the perception of the possibility of losing a family member. Factor analysis yielded one factor with 74% of the variance explained, while Cronbach alpha reliability for the four items was $\alpha = .88$.

Near-Miss Experiences

Near-miss experiences were assessed through two items, namely “Should you normally have been in a place where a blast occurred and for some reason did not get there (e.g. you missed a bus that later exploded)?” and “Have you ever left a place and shortly after a bomb went off?”.

Media Exposure

Media exposure was assessed through one question on a five-point rating scale (“After a terror attack, do you watch TV, listen to the radio or read newspapers to find out about the attack?”). Although interpreting the results for this question obviously calls for some caution, this concise operationalization maintained a balance between the depth and the length of the questionnaire. This was deemed acceptable given the state of the art in this field.

As stated earlier, these two exposure components were presented separately in view of the fact that they each contain a possible mix of objective and subjective exposure elements. In addition, brevity of measurement did not allow for further index construction.

Mental Health Outcomes

Post Traumatic Stress (PTS)

Post-traumatic stress was assessed in the final part of the “Exposure to Terror and Post-Traumatic Stress

Questionnaire”. The “Post-Traumatic Stress Index” consisted of a rewording of the DSM-IV criteria for PTSD with a yes/no answer format (e.g. “Have you had bad dreams as a result of the terror attack(s)?”; “Do you re-experience the attack(s) through mental images and hallucinations?”). The resulting 16 items showed satisfactory Cronbach alpha reliability ($\alpha = .74$).

Behavioral and Emotional Problems

Behavioral and emotional problems were assessed by the Hebrew version of Achenbach’s Youth Self-Report (YSR; Achenbach and Rescorla 2001). The YSR (ages 11–18) measures a wide range of behavioral and emotional problems based on 112 items that yield a total problem score along with two broad-band scales (internalizing and externalizing), eight subscales and six DSM scales. This instrument has been widely documented and displays good internal consistency, test–retest reliability (.87) and content validity (Achenbach and Rescorla 2001). In our sample, the Total Problem Scale yielded a Cronbach alpha of .91.

Psychological and Psychiatric Problems

These problems were gauged by the Brief Symptom Inventory (BSI; Derogatis 1993). This inventory measures nine dimensions of mental health difficulties (53 items on a Likert five-point scale), which are summarized by a “Global Severity Index” (GSI). The BSI has good internal consistency for the GSI ($\alpha = .90$) and its subscales ($\alpha = .68$ –.91) (Derogatis 1993). Due to restrictions imposed by the Israeli Ministry of Education, five items of this questionnaire had to be omitted (namely “Thoughts of ending your life”, “Spells of terror or panic”, “Feelings that you were being watched by or talked about by others”, “The idea that someone else can control your thoughts” and “The idea that you should be punished for your sins”). Since the BSI manual states that omitting up to 25% of the items (≤ 13 for the GSI and ≤ 1 for the subscales) does not harm the reliability of the scales, only the “Psychotics” subscale had to be fully omitted since too many items had been removed. In the absence of a published translation, we created a reliable Hebrew version of this questionnaire using back translation. The Cronbach alpha reliability of the GSI for this sample was .93.

Results

Preliminary Descriptive Analyses

For descriptive purposes, the sample’s types and levels of exposure along with the distribution of mental health outcomes were first explored. Table 1 shows the means and

Table 1 Correlations between exposure types and mental health outcomes

Variable	1	2	3	4	5	6	7
1. Objective exposure	X	.18*	.14*	.34*	.23*	.13*	.13*
2. Subjective exposure		X	.23*	.19*	.44*	.35*	.26*
3. Media exposure			X	.09*	.14*	.05	-.05
4. Near-miss				X	.13*	.13*	.09*
5. PTSS					X	.69*	.60*
6. BSI						X	.69*
7. YSR							X
<i>M</i>	1.33	2.31	3.54	.42	4.11	.62	37.75
<i>SD</i>	1.96	.76	1.04	.65	2.93	.60	19.23
Range	0–13	1–4	1–5	0–2	0–14	0–3	0–109

Note: *n* = 913. PTSS refers to Post traumatic stress symptoms. BSI refers to the General Severity Index of the Brief Symptom Inventory (Derogatis 1993). YSR refers to the Total Problem Scale of the Youth Self-Report (Achenbach and Rescorla 2001)

* *p* ≤ .001

standard deviations for all the key variables. The descriptive analyses showed that approximately two thirds of the adolescents reported some level of objective exposure to terror attacks, while one tenth also reported physical exposure to more than one attack, and almost one third reported having had a relationship with more than one victim. Although over one third mentioned no objective exposure, nearly nine out of ten adolescents indicated that they had experienced some level of exposure through the media, and half of the sample reported high to very high levels of subjective exposure. One third of the adolescents also mentioned near-miss experiences.

Correlation Analyses

Relationships Between Exposure Components

To gain insight into the nature of the exposure concept, the relevance of distinguishing between the different exposure types was first examined by analyzing the associations between them. Table 1 sheds some light on the proposed conceptualization of persistent exposure. The significant correlations between the investigated components appear to attest to the suggested multidimensional nature of exposure, while the relatively limited extent of these correlations appears to underscore the need to differentiate between components. As regards the concept of mixed exposure and given the postulated definitions, a comparison of the sets of correlations further points to the predominance of subjective aspects in relation to media exposure and of objective aspects in near-miss experiences.

Relative Association of Exposure Components with Mental Health Outcomes

One of our primary goals was to examine how the different exposure components, when operationalized consistently, relate to adolescents’ psychological outcomes. Given the inconclusive literature and limited investigation of some components, we expected all of the forms of exposure to correlate significantly and positively with the investigated outcomes, but with a relative precedence of the objective and subjective components.

As further shown in Table 1, all the exposure components were indeed significantly associated with adolescents’ self-reported PTSS. Furthermore, all of the components, with the exception of media exposure, were significantly linked to adolescents’ behavioral and emotional problems and general symptom severity. However, this correlation was largest for subjective exposure, whereas it was much more limited for both near-miss experiences and objective exposure. Further analysis showed that only 14% of those reporting no objective exposure also reported no symptoms of post-traumatic stress. The role of media exposure was the least prominent, given that it showed a significant correlation only with PTSS, and this only to a modest extent.

Associations of Gender and Age with Mental Health Outcomes

To determine whether typical demographics played a role in our sample’s responses to ongoing terror, we examined whether there were any differences in mental health outcomes according to gender or age (It should be noted here that objective exposure levels did not differ significantly across gender or age groups). As shown in Table 2, the expected gender differences emerged, with girls reporting significantly more post-traumatic stress, overall emotional and behavioral problems and global symptom severity than boys. In contrast, age differences were less prevalent, and when they occurred they followed a less expected pattern, as also shown in Table 2. Indeed, the adolescents’ ages, divided into youngest, middle and oldest (ages 12–13.6, 13.7–15.6 and 15.7–18, respectively), did not correlate significantly either with post-traumatic stress or with behavioral and emotional problems (YSR Total Problem Scale). However, older adolescents appeared to express significantly a more general severity of symptoms than their younger counterparts. As revealed by the regression analyses below, this finding may relate to older adolescents’ experiencing significantly more subjective exposure than those of the other age groups.

Table 2 Gender and age distributions of exposure experiences and mental health outcomes

Variable, demographic, group	<i>M</i>	<i>SD</i>	<i>t</i>	<i>F</i>
<i>(1) Objective exposure</i>				
Gender				
Boys	1.26	1.94	-.97	
Girls	1.39	2.00		
Age				
Young	1.18	1.77		2.93
Middle	1.28	1.92		
Old	1.58	2.23		
<i>(2) Subjective exposure</i>				
Gender				
Boys	2.14	.75	-6.60***	
Girls	2.48	.73		
Age				
Young	2.20	.74		8.74***
Middle	2.29	.76		
Old	2.48	.74		
<i>(3) Media exposure</i>				
Gender				
Boys	3.50	1.04	-1.19	
Girls	3.58	1.04		
Age				
Young	3.50	1.05		1.91
Middle	3.60	1.02		
Old	3.55	1.02		
<i>(4) Near-miss</i>				
Gender				
Boys	.38	.62	-1.78	
Girls	.46	.68		
Age				
Young	.38	.61		.67
Middle	.42	.67		
Old	.49	.67		
<i>(5) PTSS</i>				
Gender				
Boys	3.27	2.57	-8.97***	
Girls	4.94	3.04		
Age				
Young	4.01	2.98		.43
Middle	4.14	2.88		
Old	4.24	2.95		
<i>(6) BSI</i>				
Gender				
Boys	.48	.51	-6.79***	
Girls	.75	.65		
Age				
Young	.55	.57		5.10***
Middle	.61	.58		
Old	.72	.65		

Table 2 continued

Variable, demographic, group	<i>M</i>	<i>SD</i>	<i>t</i>	<i>F</i>
<i>(7) YSR</i>				
Gender				
Boys	36.31	18.69	-2.28*	
Girls	39.23	19.67		
Age				
Young	36.87	19.79		1.90
Middle	37.21	18.50		
Old	39.81	19.40		

Note: PTSS = Post traumatic stress symptoms. BSI refers to the General Severity Index of the Brief Symptom Inventory (Derogatis 1993). YSR refers to the Total Problem Scale of the Youth Self-Report (Achenbach and Rescorla 2001)

Boys: *n* = 447 for boys. Girls: *n* = 462 for girls. Young adolescents (ages 12–13.6): *n* = 305. Middle adolescents (ages 13.7–15.6): *n* = 349. Older adolescents (ages 15.7–18): *n* = 255

* *p* ≤ 0.05; ** *p* ≤ 0.01; *** *p* ≤ 0.001

Regression Analyses

To further clarify our main research focus, we conducted stepwise regression analyses to determine to what extent the different exposure types along with the selected demographics accounted for PTSS, behavioral and emotional problems and overall symptom severity. Gender and age were entered subsequently on the first step in each model. On the second step, the exposure components were entered in the order outlined in Table 3. These steps were performed for each outcome separately. Table 3 also summarizes the significant results.

As shown in Table 3, on the first step gender was a significant predictor of adolescents’ self-reported mental health outcomes; this was in line with its overall expected effect. However, this effect varied across outcomes. While gender significantly explained a small amount of the variance in PTSS and in general symptom severity (<10%), it did not significantly affect youngsters’ behavioral and emotional problems (YSR Total Problem Scale). Age was not a consistent factor in any of the three outcome models, showing a significant effect only in the first step of the regression analysis for the general symptom severity (BSI).

On the second step, subjective exposure emerged as the most consistent and strongest predictor of all the mental health outcomes. Higher levels of subjective exposure predicted higher levels of self-reported PTSS, behavioral and emotional problems and psychological or psychiatric symptom severity. The predictive power of objective exposure, although statistically significant, was limited, accounting for 3% of the variance of adolescents’ PTSS and 2% of their behavioral and emotional problems, while not being significantly associated with general symptom

Table 3 Stepwise regression analyses for demographic and exposure-to-terror variables predicting adolescents' mental health outcomes

Outcome, step, predictors	R^2	B	β	SE	t
<i>(1) PTSS</i>					
Step 1					
Gender	.08	1.66	.28	.21	8.09***
Step 2					
Gender		1.18	.20	.19	6.17***
Subjective exposure	.14	1.35	.35	.13	10.46***
Objective exposure	.03	.21	.14	.05	4.18***
<i>(2) BSI</i>					
Step 1					
Gender	.06	.28	.24	.04	6.61***
Age	.01	.07	.10	.03	2.64**
Step 2					
Gender		.20	.17	.04	4.87***
Age		.03	.04	.03	1.10
Subjective exposure	.08	.22	.28	.03	7.63***
Near-miss	.01	.10	.11	.03	3.07**
<i>(3) YSR</i>					
Step 2					
Subjective exposure	.06	5.93	.24	.92	6.45***
Media exposure	.01	-2.53	-.14	.67	-3.78***
Near-miss	.01	2.91	.10	1.12	2.61**
Objective exposure	.01	.80	.09	.35	2.25*

Note: $n = 913$. PTSS refers to Post traumatic stress symptoms. BSI refers to the General Severity Index of the Brief Symptom Inventory (Derogatis 1993). YSR refers to the Total Problem Scale of the Youth Self-Report (Achenbach and Rescorla 2001)

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$

severity. The impact of objective exposure thus appeared to be more in line with that of near-miss experiences, which contributed significantly yet minimally to adolescents' Achenbach- and BSI-reported mental health difficulties (with explained variances under 1%), but not to PTSS. Media exposure, in turn, was significantly, but negatively, associated only with adolescents' behavioral and emotional problems. In contrast to the hypothesis that media exposure contributes towards mental health difficulties in young people, the beta indicated that the more adolescents consulted the media, the *less* they experienced behavioral and emotional problems.

Discussion

This study examined the relative contribution of different components of exposure to adolescents' self-reported mental health outcomes in the context of persistent terror attacks. Given the state of the art in the field, it was

necessary to expand on previous research by clarifying the operationalization of these components in order to provide a more explicit, comprehensive and systematic conceptualization of ongoing exposure to terror. To this end, we adopted a multidimensional perspective, differentiating between objective exposure (including direct physical exposure and relationships with terror victims), subjective exposure (defined as thoughts and feelings of endangerment at the time of an attack) and mixed exposure (including media exposure and near-miss experiences) which potentially contained characteristics of the other two types of exposure. In this discussion, we first discuss the relationship between the exposure components, followed by their relative impact, the role of gender and age and, finally, the extent to which these factors allow us to predict adolescents' mental health outcomes when facing ongoing exposure to terror.

Relationships Between the Exposure Components

Taking into account the adopted multidimensional perspective, we first examined the relationship between the exposure components. Consistent with the proposed conceptualization, our findings corroborate the assumption that the different types of persistent exposure to terror merit distinct examination as regards their effects on adolescents' mental health outcomes. Indeed, the low correlations permit us to consider them as distinct components. In addition, the proposed concept of mixed exposure finds common ground in the association of objective exposure with near-miss experiences on the one hand and that of subjective experiences with media exposure on the other hand. These findings underscore the relevance of examining persistent exposure to terror in multidimensional terms. Above all, our findings suggest that research must differentiate between those aspects that refer to objectively observable events and those that refer to adolescents' cognitive and emotional experiences when these events occur.

The Relative Role of Different Types of Exposure

Consistent with our main research goal, the relative role of objective, subjective and mixed exposure to ongoing terror was then examined. This further yielded evidence that may potentially be of major importance for a clearer understanding of how these components affect adolescents' mental health outcomes. Indeed, the association between objective levels of exposure and psychological difficulties appeared weak. While to some extent previous research has found similar evidence (e.g. Pfefferbaum et al. 2002; Schiff 2005; Rosenberg et al 2008), it is noteworthy that the present findings are based on the simultaneous assessment of the different components of exposure in a group of

youngsters who have experienced long-term objective exposure to terror.

Based on these results, objective events appear not to be the most important factor predicting psychological problems in adolescents faced with persistent exposure to terror. Instead, subjective experiences of exposure to terror, namely thoughts and feelings of endangerment during the events, are the most salient predictor of adolescents' mental health outcomes. These findings are consistent with the few studies that have explored this dimension explicitly, albeit labeled differently, and that demonstrated the role of fears and worries when exposed to terror (e.g. Pfefferbaum et al. 2002, 2003; Solomon et al. 2005). While the findings point to the relevance of investigating coping responses (e.g. Gil 2005), it should be noted that subjective exposure precedes such responses by referring to the initial reciprocal effects between cognitive control and emotion regulation when confronted with terror events. The current findings suggest that closer investigation of these dynamics in relation to behavioral responses may be fundamental to gaining insight into how potentially traumatizing experiences result in varying degrees and types of mental health outcomes in adolescents faced with persistent terror (Butler 2007; Celestin and Celestin-Westreich 2008; Celestin-Westreich and Celestin 2008b, in press; Celestin-Westreich et al. 2007; Joshi and O'Donnell 2003; Rosenberg et al. 2008; Schiff 2005; Taylor and Liberzon 2007; Tull et al. 2007; Wooding and Raphael 2004; Zeidner 2005).

In regards to the role of mixed exposure components, near-miss experiences appear to follow a pattern similar to that of objective exposure. However, because near-miss experiences have received only limited attention (see, for example, Pat Horenczyk's research 2003, 2005) with—possibly inherently—limited operationalization, it may be premature to attempt to draw any firm conclusions about their impact. It would be wise to include these issues in future research.

The role of media exposure is more puzzling. While media exposure has been documented fairly well as a variable that increases post-traumatic symptoms among young people in the wake of single occurrences, such as the Oklahoma bombing and the attacks of September 11 (e.g. Hoven et al. 2004; Pfefferbaum et al. 2001), it appears to have been relatively overlooked in the context of ongoing terror. The pattern observed in our findings, whereby adolescents who resort to more media exposure report fewer behavioral and emotional problems, appears counterintuitive at first sight. Yet, several possible explanations may account for these findings. First, it may be that adolescents who have experienced persistent exposure to terror get used to the media coverage. Second, the media in this societal context may also have adapted to the situation by dealing more sensitively with this type of recurrent terror

attacks, whereas this is not the case for the media in communities exposed to single terror occurrences. Alternatively, consulting the media may be an effective means of coping with persistent risks of terror through information gathering. Admittedly, though, given that this study measured media exposure by using only one item, these possibilities remain suggestive and require more testing.

In sum, while objective events do impact on adolescent's mental health difficulties, it appears that these do not relate as closely to difficulties compared to the subjective experiences that accompany the exposure to persistent terror. Similarly, near-miss and media exposure seem to exert limited effects on adolescents psychological outcomes. Since these exposure components have remained understudied, however, further investigation of their effect in replication studies and with more elaborated operationalizations remains important.

Demographic Effects

We also aimed to assess the impact of adolescents' gender and age on their mental health outcomes when confronted with ongoing terror. In this regard, gender emerges as the second most significant factor among those investigated in this study. Consistent with the literature on exposure to terror and on general developmental psychopathology, our findings reveal that girls tend to resort more to internalizing stress responses than do boys who externalize more readily even when confronted with similar levels of objective exposure (e.g. Hoven et al. 2002; Pat Horenczyk et al. 2007; Pfefferbaum et al. 1999a, b; Sever et al. 2008). In contrast, the limited, inconsistent age effect found in our population contradicts the findings of most other studies, but is consistent with research by Solomon et al. (2005), which found no age effects in a cohort in the beginning of the al-Aqsa intifada. Taking into account the study period, cohort effects may apply. For example, for the adolescents investigated in our sample, it seems that the subjective exposure experience was stronger for older adolescents. Such findings may indicate that, in the context of persistent exposure to terror, age plays a different role depending on previous experiences and the wider societal environment of a specific cohort of youngsters. In short, major demographics such as gender and age need to be considered when dealing with the outcomes of persistent exposure to terror. Although gender effects are now well documented, this is not yet the case for age, which may exert more complex effects in this context.

Limitations and Future Directions

A proper assessment of the research and practice implications of this study requires acknowledging certain

limitations and drawing conclusions that can be translated into future avenues for research. First, since all the data are retrospective self-reports, the extent to which adolescents' experiences of stress and mental health difficulties converge with external observations, such as parental, teacher and clinical reports, remains to be investigated. Although young people's self-reports are generally a reliable source about internalizing and stress experiences, an assessment of externalizing outcomes may benefit from multiple-informant evaluations. As a rule, the multi-informant paradigm facilitates evaluating youngsters' psychological difficulties across different environments (Celestin-Westreich and Celestin 2008a, in press; Koplewicz et al. 2002). More specifically, our findings are in line with previous research in suggesting that outcome- or measurement-specific effects need to be taken into account when examining exposure–symptom correlations (e.g. Rosenberg et al. 2008). Throughout the regression analyses, it indeed appeared that both demographic and exposure variables were differentially associated with outcomes, predicting some but not all of adolescents' self-reported mental health difficulties. Multi-informant assessments will be helpful in specifying to what extent these demographic and exposure–outcome associations refer to effective outcome differences or to measurement-specific effects.

Second, in the absence of a base rate for the participating adolescents' mental health indicators prior to the study period, we cannot state with certainty whether or not the observed outcomes are due solely to the impact of exposure to terror. This limitation is obviously inherent to the research field; only in rare occasions were any baseline data available when a population study had quite by chance been conducted shortly before the occurrence of traumatizing events. But, it suggests that there is a need to develop longitudinal designs that are better suited to an evaluation of cause–effect relations.

In terms of future designs, the multidimensional conceptualization of exposure, as defined in our study, contributes to a developing body of research into the specificities of persistent exposure to terror (e.g. Rosenberg et al. 2008). Even though preliminary evidence suggests that objective exposure may have less direct effects in the context of ongoing exposure, many aspects warrant further investigation. Additional in-depth analyses of the potential role of different patterns of cumulative objective exposure (e.g. as regards the duration between exposures to attacks) and their link with subjective (perceived) danger may refine our understanding of how adolescents modulate their cognitive, emotional and behavioral responses. Preliminary findings suggesting that age cohorts may play a role in this context also warrant further study. Similarly, given the inconclusive findings regarding the role of mixed exposure components, there still is a need to improve and expand the

measurement of these components in future research into adolescents' responses to ongoing terror.

Finally, a potential degree of sample bias cannot be ruled out. For one thing, a small percentage of the adolescents did not complete the questionnaires. Although this amounts to only 2% of the sample, this group could constitute a significant few relative to the links between levels of exposure and intense adverse mental health outcomes. In addition, we investigated a relatively large sample representing different segments of the Israeli adolescent population in terms of location, age range and levels of exposure. Generalization of the findings nonetheless calls for caution with regard to additional socio-demographic descriptors that were not investigated here, such as ethnic diversity and religious observance. These characteristics deserve more investigation in the future, especially as the observed importance of subjective aspects of exposure may interact with such characteristics.

Taken together, longitudinal designs along with closer investigation of adolescents' cognitive and emotional regulation dynamics and how these interact with coping responses are likely to contribute not only to the research base but also to adjusting prevention efforts and intervention programs to the needs of youth confronted with recurrent terror.

Conclusions

The main aims of this study were to clarify different components of exposure in order to examine which are most relevant to an understanding of the mental health outcomes of adolescents faced with ongoing terror attacks. Subjective exposure, namely thoughts and feelings of endangerment during recurrent terror events, emerged as the predominant predictor of adolescents' post-traumatic stress reactions, behavioral and emotional problems and overall symptom severity in this specific context, along with a better-known gender effect. An analysis of the cognitive and emotional dynamics that trigger the coping process could therefore be the key to a deeper understanding of how young people deal with the experience of persistent exposure to terror. Although objective and mixed forms of exposure (such as near-miss experiences and media exposure) are apparently far less substantial predictors in this regard, an in-depth analysis of exposure characteristics specific to recurrent exposure to terror experiences is warranted. To build on the current initiative, integrating these elements into a comprehensive theoretical framework can guide longitudinal research and enhance the understanding of the underlying processes at work. This is also likely to facilitate the development of prevention or intervention programs that address the specific challenges

for adolescents growing up in a society in which they are confronted with recurrent terror threats and thereby with persistent sources of trauma.

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