

Examining the Scientific Validity of Rape Trauma Syndrome

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Rape trauma syndrome (RTS) was first described by Burgess and Holmstrom (1974) who argued that there was little information that described the physical and psychological effects of rape, associated therapy and provisions for protection of the victim from further psychological harm. Since then, there have been several critiques of RTS and empirical evidence exists that RTS is not generally accepted by the relevant scientific community. Despite this, RTS is still used in courts. As such, in this article, we comprehensively evaluated RTS and determined that it is vague and imprecise, its evidential status is questionable, it is inconsistent with the most common sequelae of trauma, it ignores important mediating variables and it may not be culturally sensitive. In light of these critiques, we recommend no further use of this model in courts or in clinical practice.

Key words: forensics; junk science; PTSD; rape trauma syndrome; sexual assault.

What is Rape Trauma Syndrome?

Rape trauma syndrome (RTS) was first described by Burgess and Holmstrom (1974) who argued that there was little information that described the physical and psychological effects of rape, associated therapy and provisions for protection of the victim from further psychological harm. In light of these gaps, Burgess and Holmstrom (1974) developed a victim-counseling program as a collaborative effort between a school of nursing and a local hospital in Boston to provide 24-hr crisis intervention to rape victims and to study the problems rape victims experienced as a result of their assault. Burgess and Holmstrom (1974) reported that, over the course of one year, 146 patients were admitted to the emergency ward reporting that they had been raped. These patients were classified into three categories of women: victims of forcible rape or attempted forcible rape; victims in situations

where they were unable to consent; and victims of sexually stressful situations where they initially consented but then reported that they lost control of the situation. Of these victims, only the 92 women who were victims of forcible rape were interviewed in the emergency ward; 85% of the victims who were interviewed in the emergency ward were interviewed again for a follow-up; and 5% of the victims interviewed originally were followed via their families or reports by the police or other service agencies who knew them. A member of the research team also accompanied victims who pressed charges to court and notes were taken during any contact that was made with the victim including the interview, follow-up interview, court proceedings, etc. Burgess and Holmstrom (1974) analyzed the notes in an attempt to gain a further understanding of the symptoms reported and any changes in thoughts, feelings and behavior.

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From these data, Burgess and Holmstrom (1974) derived the “symptoms” thought to be typically associated with what they came to call RTS. Burgess and Holmstrom (1974) reported that RTS denotes a two-phase reaction, “the acute phase” and “the long-term reorganization process”, that occurs as a result of either forcible rape or attempted rape. According to Burgess and Holmstrom (1974), the acute phase consists of a wide range of emotions including shock, disbelief, anger and a variety of others. In fact, Burgess and Holmstrom (1974) reported that in the immediate hours after a rape, women show two typical emotional styles: the “expressed style” (fear, anxiety, anger, crying, sobbing, restlessness, tenseness) and the “controlled style” (feelings are masked or hidden and the presentation is calm, composed or subdued). During the first several weeks following a rape, Burgess and Holmstrom (1974) also claimed that there are somatic reactions that consist of physical trauma (e.g., soreness, bruising), skeletal muscle tension (e.g., headaches, fatigue, sleep pattern disturbances, a startle reaction), gastrointestinal irritability (e.g., stomach pain, appetite disturbance, nausea) and genitourinary disturbance (e.g., vaginal discharge, itching, burning sensation on urination, generalized pain). In addition to these somatic reactions, according to the authors there are also a variety of emotional reactions including fear, humiliation, embarrassment, anger, feelings of revenge and self-blame.

With regard to the long-term process of reorganization, Burgess and Holmstrom (1974) reported that there is increased motor activity among victims, change in residence, changing one’s phone number, and turning to family members who were not seen daily prior to the assault for support. Moreover, Burgess and Holmstrom (1974) reported that victims experience nightmares and what they called “traumaphobia” (fear of indoors/outdoors, being alone, crowds, people behind them, and sexual fears).

Past Evaluations of RTS

Although the Burgess and Holmstrom (1974) article received widespread attention and became influential, it was also met with some criticism. Frazier and Borgida (1985) called attention to the methodological shortcomings of the original RTS study by Burgess and Holmstrom (1974). Specifically, Frazier and Borgida (1985) pointed out that Burgess and Holmstrom (1974) drew their conclusions from an inadequate and an unrepresentative sample (i.e., only 92 adult women and only in one setting); this sample was selected by the authors from an original sample of 146 participants because only women who were forcibly raped were included as part of the study. The smaller the sample the less confident researchers can be in the conclusions they draw from that sample (Tversky & Kahneman, 1974). Frazier and Borgida (1985) also noted that Burgess and Holmstrom (1974) did not employ random sampling. Because it is estimated that only a fraction of sexual assaults are actually reported (estimates range from 3 to 26%; Fisher, Daigle, Cullen, & Turner; 2003; Rennison, 2002; Tjaden & Thoennes, 2000), this sample may offer a skewed representation of women who are sexually assaulted. In fact, Resnick (2000) found that only 56 of 214 women who reported a recent sexual assault received immediate medical care following the incident and that fear of sexually transmitted diseases and desire to report the incident to police are both significant predictors for sexual assault victims to seek medical attention. Thus, larger samples drawn from different populations appear to report somewhat different sets of post-rape consequences from found by Burgess and Holmstrom (1974).

Similar to Frazier and Borgida (1985), Haynes, Richard, and Kubany (1995) also noted sampling limitations from the research conducted by Burgess and Holmstrom (1974). Haynes et al. (1995) asserted that inferences from the data are considered more

valid when the data are gathered from multiple informants, via multiple methods and from multiple settings because this allows an appraisal of the consistency of the information. The information gathered in the Burgess and Holmstrom (1974) study was limited in all of these domains; all information was gathered through interviews conducted by the two authors in one site. No information regarding the structure of the interview or the questions asked was provided and no quantitative or qualitative coding system was described by Burgess and Holmstrom (1974). In addition, the interviews were not independent of the authors and thus there is potential for confirmation biases and other biases associated with allegiances to the authors' hypotheses. Information was only gathered from other reports (e.g., family or police) for a small number of individuals who could not be contacted at follow-up (i.e., 5%).

An additional limitation of Burgess and Holmstrom's work (1974) was that control groups were not utilized (Frazier & Borgida, 1985). Specifically, there was no assessment of how the reports from sexual assault victims compare with the reports of women who experienced other recent interpersonal trauma(s) or other women with no recent traumatic experience. The absence of a control group does not allow Burgess and Holmstrom (1974) to conclude that the observed results were specific to rape. Inferences to the specific causal role of rape cannot be made given these methods. Furthermore, Katz and Mazur (1979) also critiqued Burgess and Holmstrom (1974) for not distinguishing in their initial participant screening between incest victims, sexual assault victims involving non-penetrative sexual assault, rape victims, child victims, adolescent victims and adult victims, all of which can be important differentiations in the context of legal investigations.

In addition to these scholarly critiques of Burgess and Holmstrom's (1974) RTS, legal critiques also exist. Courts often rely on *Frye v United States* (1923) regarding the

admissibility of novel scientific techniques or theories used in expert witness testimony. The Frye test states that scientific techniques used in expert witness testimony should be generally accepted by the relevant scientific community. Subsequent to developing RTS, Frazier and Borgida (1988) examined the consensus regarding RTS among 22 experts who had conducted a minimum of two empirical studies of rape, two legal experts and two directors of rape crisis centers. The participants were mailed a seven-item survey about the admissibility of RPS in court. Frazier and Borgida (1988) found there was little consensus on item one: "A coherent and internally consistent body of knowledge on the aftereffects of rape currently exists" (i.e., mean score was a 3 on a Likert scale where 1 = strongly agree and 7 = strongly disagree; p. 112). The results of this survey suggested, at least initially, that RTS may not meet the requirements of the Fry test because it is not generally accepted among experts.

The lack of consensus may be due to the confusion surrounding the RTS construct. Frazier and Borgida (1992) noted that RTS has multiple meanings in the literature. First, the term RTS is associated with the two-stage model of recovery following rape (Burgess & Holmstrom, 1974). Second, RTS has been conceptualized as a specific set of symptoms (e.g., sexual dysfunction, depression and feelings of humiliation; McGowan & Helms, 2003) that follow all rapes with more or less regularity. Third, RTS has been described as a specific subtype of post-traumatic stress disorder (PTSD; Block, 1990) – although this is not recognized in the DSM. Importantly, Frazier and Borgida (1992) also stated that subsequent investigations with greater methodological rigor have failed to replicate the findings of the original Burgess and Holmstrom (1974) study and research has shifted to exploring the general symptoms of RTS rather than the specific stage model. Young (1995) summarized the symptoms associated with RTS including muscle tension,

headaches, decreased appetite, insomnia, nightmares, phobias of things that are reminiscent of the assault experience and difficulty in significant relationships, which does encompass all the symptoms described in the original study, suggesting that the RTS construct has been refined in the absence of scientific investigation.

The Major Problems with RTS

Philosophers of science have asserted that for a theory or hypothesis to be testable and useful, it needs to be clear in its assertions and predictions (Laudan, 1978; Popper, 1957). In light of this and our evaluation of existing literature on RTS, we identified 19 critiques of RTS and organized them under three categories. A description of each critique follows.

Vagueness and Imprecision

The utility and testability of a theory are dependent on clearly stated assertions and predictions. RTS is vague and imprecise in a number of critical ways, as outlined below.

Is Not Clear What It Is

Researchers must operationally define any construct of interest to both clearly communicate findings and facilitate replication. Unclear constructs and vague operational definitions can lead to unsound scientific research. Burgess and Holmstrom (1974) originally referred to RTS as “the acute phase and the long-term reorganizational process that occurs as a result of forcible rape or attempted forcible rape,” but in the very next sentence stated, “This syndrome of behavioral, somatic, and physiological reactions is an acute stress reaction to a life threatening situation” (p. 981). It is unclear if RTS is a phase model of traumatic stress reactions or a characteristic group of symptoms present without reference to time. In addition, it is unclear what event(s) (e.g., forcible rape,

attempted rape, or another type of life-threatening situation) must precede the onset of the RTS stress reactions and/or symptoms. It is also unclear to what extent these purported symptoms cohere. In medicine, syndrome has multiple meanings. O’Donohue and Benuto (2012) previously highlighted that a syndrome can refer to “a group of symptoms that collectively indicate or characterize a disease, psychological disorder, or other abnormal condition” (Dictionary.com, n.d.); RTS fails to meet this definition. The “symptoms” described by Burgess and Holmstrom (1974) range greatly across individuals, even by their own admission: “Victims express a wide gamut of feelings as they begin to deal with the aftereffects of the rape” (p. 982). The authors described how both the expression and concealment of emotions are characteristic reactions of RTS. That is, although RTS describes symptoms that may be present, there are no necessary or sufficient diagnostic criteria. In addition, Burgess and Holmstrom (1974) failed to present correlations regarding symptoms, so a determination could not be made regarding the extent to which these individual symptoms actually co-occur and thus represent a syndrome.

A second common definition of syndrome is “a group of symptoms, signs, laboratory findings, and physiological disturbances that are linked by a common anatomical, biochemical, or pathological history” (Taber’s Cyclopedic Medical Dictionary, 21st ed., n.d.); RTS does not specify a common history. Although the name rape trauma syndrome implies it is a reaction to rape, Burgess and Holmstrom (1974) stated that RTS may develop also from attempted rape and other experiences (i.e., history of physical, psychiatric or social difficulties) that influence the type and number of “symptoms” a woman may display. Finally, because Burgess and Holmstrom did not study the commonality of these symptoms in women who were falsely reporting rape, it is unclear whether these symptoms can be used to make an inference regarding prior rape status. Therefore, the

construct of RTS is limited as a syndrome and/or model in two critical ways: (1) it cannot with any known accuracy actually predict the specific symptoms a woman will exhibit following sexual assault; and (2) it cannot assert that sexual assault was, in fact, the event that caused "symptom" onset.

RTS is Vague in Important Details

In addition to the operational definition of the construct of interest, it is important for researchers to indicate how the construct of interest converges with other constructs (Cronbach & Meehl, 1955). Failing to specify convergent and discriminant validity within a study can limit the interpretation of research findings. Burgess and Holmstrom (1974) used vague terms when describing the phase sequence of RTS. For example, no concrete quantitative timeline is given for the putative phases. The acute phase was described in terms of both the immediate hours following the rape and the first several weeks following the rape, leaving the time parameters around typical symptom onset open to interpretation. The second phase may occur three weeks following the rape, but "the time and onset varies from victim to victim" (Burgess & Holmstrom, 1974, p. 982).

Furthermore, Burgess and Holmstrom (1974) are vague in their assumptions regarding victims' pre-rape status; "The victim was regarded as a 'normal' woman who had been functioning adequately prior to the crisis situation" (p. 984). It is not clear what qualifies a woman as "normal" and her functioning as "adequate". Furthermore, it is not clear what assessment methodologies Burgess and Holmstrom (1974) used to make this determination in their sample. They do not report excluding any women who failed to meet these inclusion criteria. Additionally, if these assumptions are not met, it is not clear how these violations impact upon RTS. There was no pre-rape status assessment to determine how post-rape observations represented a disjuncture from pre-rape status. Previous

victimization of rape victims is high: 67% of women who report sexual victimization report multiple instances of sexual victimization such as child sexual abuse (Cloitre & Rosenberg, 2006). Some post-rape observations by Burgess and Holmstrom (1974) of pathology in their sample could be in part due to prior victimization. Burgess and Holmstrom (1974) noted that the minority of their sample (number unspecified) experienced a "compounded reaction," but this reaction vaguely referred to "past physical, psychiatric or social difficulties" and no previous sexual victimization was specifically referenced (p. 985). In sum, the details described above greatly limit the interpretability of the original RTS study findings.

It is Unclear What Its Boundary Conditions Are

In addition to convergent and discriminant construct validity, the external validity of a study is also important. Research aims to discover under what parameters (e.g., settings and samples) findings can be generalized. RTS ignores important parameters of rape and how these may impact stress reactions. Katz and Mazur (1979) critiqued RTS for not distinguishing between child, adolescent and adult victims. The original RTS study consisted exclusively of adult women and it is not clear how RTS generalizes across ages or developmental stages. Furthermore, there are various levels of sexual assault, between which RTS does not distinguish. The original sample consisted of 92 women who reported being forcibly raped and this may be interpreted as sexual assault involving perpetration, but this is never explicitly stated. The Sexual Experiences Survey (SES; Koss & Gidycz, 1985), a measure frequently used in sexual trauma research (Marx & Soler-Baillo, 2005; Wilson, Calhoun, & Bernat, 1999; Yeater & O'Donohue, 2002). The SES distinguishes between sexual contact, attempted penetration and completed penetration, as well as the types of penetration. Burgess and

Holmstrom (1974) suggested that RTS follows experiences of attempted forcible rape and forcible rape, which was vaguely defined as “carnal knowledge of a woman by an assailant by force and against her will” (p. 982). It seems that the RTS would only apply to a penetrative act on an adult female, but this is unclear. In general, sexual assault is thought of as any nonconsensual sexual contact. Although the authors mentioned distinct physiological reactions in women who had experienced anal rape, no other distinctions between various levels of sexual assault were referenced and how these might have related to the observed RTS symptoms.

Furthermore, there is a distinction between acquaintance rape and stranger rape, in which the victim knows or does not know the perpetrator, respectively (Hickman & Meuhlenhard, 1997; Hoyt & Yeater, 2009). It has been estimated that between 80 and 90% of sexual assaults are committed by an acquaintance (Koss, Dinero, Seibel, & Cox, 1988). Given that the majority of rapes are perpetrated by an acquaintance, prototypical post-rape reactions would be observed in a sample of acquaintance rape victims. Burgess and Holmstrom (1974) did not describe their sample in terms of knowledge of the perpetrator; their sample may have been heterogeneous in terms of this dimension and no analysis was done to determine if there were differential reactions.

Additionally, Burgess and Holmstrom (1974) neglected to note other potentially important variables regarding the context in which the rape occurred (e.g., substance and alcohol use, use of “ruffies” which can cause memory gaps). The amount of alcohol a woman consumes is correlated more highly with completed rape compared with attempted rape, and with the severity of the sexual assault that occurs (Chermack & Giancola, 1997; George & Stoner, 2000; Testa & Livingston, 1999). Because of the high correlation between victim alcohol/substance use and sexual assault, researchers have distinguished between

incapacitated/drug-alcohol facilitated rape (AIR) and forcible rape (FR), which are based on endorsements of rape that did or did not involve the use of intoxicants, respectively (McCauley, Calhoun, & Gidycz, 2010). Burgess and Holmstrom (1974) neglected to distinguish between AIR and FR and did not describe how each context may influence RTS phases and symptoms.

Finally, RTS fails to explain how RTS symptoms may be exhibited in a male victim. Although the majority of sexual assaults victims are female, it is estimated that between 0.6 and 22.2% of males also experience sexual assault (Coxell, King, Mezey, & Gordon, 1999; Tewksbury, 2007). Burgess and Holmstrom’s (1974) sample was exclusively women and the authors did not speculate as to how RTS may generalize to men who have been sexually assaulted. Given the specific nature of RTS (i.e., reactions exclusively following rape or attempted rape), the authors failed to specify how RTS can generalize across social demographic variables (e.g., age or gender), define the parameters of rape or describe contextual variables surrounding the rape (e.g., alcohol or knowledge of the perpetrator).

It Uses Unclear Terms That Do Not Have a Basis in Psychological Science

Scientific terminology allows for common language among researchers and aids in the communication of scientific findings. Inconsistent terminology in research may lead to confusion and miscommunication within the scientific community. Burgess and Holmstrom (1974) used informal and out of date terminology in the description of RTS. For example, the authors use the term “disorganization” to describe the woman’s lifestyle in the acute phase as a result of the rape (p. 982). In the context of psychopathology, the term disorganized is used to describe positive symptoms of psychosis such as disorganized speech or behavior (American Psychiatric Association [APA], 2013). Because RTS refers to

disorganization outside the context of psychosis, it is unclear what the term means in their article. Authors can use new terms, but it is useful for them to both precisely define these and to show how these new constructs can be validly measured. It is very important that many of the terms that Burgess and Holmstrom (1974) use do not have any validated measures and thus it is unclear how anyone can make valid inferences using them. Furthermore, Burgess and Holmstrom (1974) claim that women attempt to "reorganize" their lifestyles in the second phase. Again, the term "reorganize" has no basis in psychological science and Burgess and Holmstrom fail to describe a valid measurement strategy for this construct.

In addition, Burgess and Holmstrom (1974) use the term "traumatophobia" to describe a collective set of fears that develop following rape. This term is not included in current or previous versions of the DSM (APA, 2000, 2013) and again it is unclear how these authors validly measured this novel construct. Although the term phobia is included in previous and current versions of the DSM, phobia refers to a persistent fear of an object or situation that is often recognized as irrational (APA, 2000, 2013). However, women who avoid stimuli or situations associated with a rape are exhibiting symptoms that are arguably different from phobic symptoms, given that these feared stimuli and situations were previously followed by factual danger (i.e., sexual assault). Therefore, the construct of traumatophobia is an outdated and possibly misleading term used to describe RTS symptoms.

It Fails to Specify Key Quantitative Relationships

Burgess and Holmstrom (1974) stated important relationships qualitatively where it would be much more informative and useful to express these quantitatively. What are the probabilities that each symptom was displayed by women in their sample? What are

the joint probabilities for symptom clusters? What is the probability that women expressed the controlled style versus the expressive style? What is the probability at a certain point in time that something in the RTS would be observed to occur? When these are described qualitatively instead of qualitatively, we just know that it is possible for X to occur, but the strength of this relationship is unknown because key quantitative information is lacking.

Criticism of its Evidential Status

It is well documented that clinical judgment is inferior to actuarial judgment and that clinicians are prone to heuristic errors and confirmation biases (Dawes, Faust, & Meehl, 1989). Therefore, expert opinions should be grounded in science and based upon methodologically sound data (Lilienfeld & Landfield, 2008).

There Was No Independent Determination to Ensure All Women's Rape Claims Were Indeed True

Distinguishing between true and false accusations of rape is a controversial and sensitive subject (Engle & O'Donohue, 2012). Regardless of the sensitive nature of the topic, false accusations of rape do occur. It is difficult to estimate the proportion of false to true rape accusations, due in part to the low rate at which sexual assault is reported as well as inconsistent definitions of what constitutes a false accusation (Saunders, 2012). In the Burgess and Holmstrom (1974) study, participants underwent physical and gynecological examinations, but injuries related to sexual assault were not required for a RTS diagnosis. Compared with genuine rape accusations, Hunt and Bull (2012) found false rape accusations to be more strongly associated with reports of outdoor assault and reports in which the perpetrator "surprised" the victim. Additionally, the authors found false rape accusations to be

negatively related to physical injuries and substance use at the time of assault. Burgess and Holmstrom (1974) did not distinguish between participants based on any contextual assault variables. The validity of the rape accusations was determined exclusively by the authors, with no attention given to variables associated with false rape accusations. They apparently did not exclude any woman from their sample due to the dubiousness of her rape claim. Therefore, RTS symptoms may be based on the observed behaviors of both rape victims and non-victims, limiting the validity and specificity of RTS.

Limited Clinical Diagnostic Assessment

Whereas assessing the validity of alleged assaults possesses several challenges, diagnostic clinical assessment is a more straightforward task. Clinical assessment is essential to guide interventions, develop case conceptualizations and makes diagnoses (Haynes et al., 1995). Some limitations of early RTS research can be justified based on the general lack of research regarding sexual traumatic stress reactions at the time of the original Burgess and Holmstrom (1974) study. However, the study neglected to assess other psychopathology, which, even at the time, was represented in a body of research (e.g., anxiety, depression and psychosis). A description of the interview method was not presented and no specific assessment of anxiety disorders, mood disorders or psychotic disorders was conducted. There is no way to determine how much incremental validity RTS provided beyond existing psychopathological diagnoses because no clinical assessment data were collected. This is extremely problematic given that current research suggests that post-traumatic distress is highly correlated with depressive symptoms and substance abuse, and that a previous history of psychopathology is a risk factor for post-traumatic distress (Kessler, Chiu, Demler, & Walters, 2005; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). Furthermore, some clinical

symptoms and conditions, which were not assessed by Burgess and Holmstrom (1974) including antisocial personality disorder, borderline personality disorder, histrionic personality disorder, delirium, psychotic disorders, dissociation and intellectual disability, have been proposed as pathways to false sexual assault accusations (Engle & O'Donohue, 2012).

The Psychometric Adequacy of Measurement Operations to Measure Key Constructs

The adequacy of psychological measures is dependent on their reliability, validity and standardization (Michell, 1997; Wood, Garb, & Nezworski, 2007). Weaknesses in one of these domains limit the internal validity of a study and the interpretability of its findings. Burgess and Holmstrom (1974) collected their data by interviewing patients at their clinic. Data gathered from interviews can be biased due to social desirability and participants' own discomfort with disclosing personal information (Guinn et al., 2010). Interviewers' characteristics and biases can also influence how interviewers interpret information and determine subsequent queries (Tanaka-Matsumi, 2004). Furthermore, because the interview method requires retrospective recall, the information gathered is prone to memory errors and recall biases (Graham, Catania, Brand, Duong, & Canchola, 2003). There was no information about how recent the sexual assaults were. A lack of training and experience on the part of the interviewers can result in erroneous data and weaken the validity of the clinical judgments based on the data (Bootzin & Ruggill, 1988). The data gathered in the original RTS study by Burgess and Holmstrom (1974) are prone to error and misinterpretation due to all the limitations described above. Self-report data can be accurate, but also can be an exaggeration or a minimization (Haynes, Mumma, & Pinson, 2009; Haynes, O'Brien, & Kaholokula, 2011). Furthermore, because Burgess and Holmstrom (1974) did not use a structured

interview method, there is no information regarding the reliability, validity or norms regarding their interview methodology. That is, there is no way of knowing if the interviews were conducted consistently from participant to participant, if the queries prompted information representative of post-rape stress reactions, and if the interview method was appropriate for the study sample. Finally, data from collateral contacts were not gathered to gain some understanding of the convergent validity of the self-report data from their sample.

There Are Limited Follow-Up Data

Although the psychometric properties of methods used to collect data are important, the amount of data collected and/or the number of data collection points are also critical in order to obtain adequate power and increase one's confidence in the interpretation of findings (Faul, Erdfelder, Lang, & Buchner, 2007). The original RTS study by Burgess and Holmstrom (1974) was described as a longitudinal study, however, follow-up data were quite limited despite their claims of stages and reactions occurring over the passage of time. There was only one follow-up conducted one year after the initial interview (with a 15% attrition rate), leaving many temporal gaps. In a methodological review of longitudinal research with sexual assault survivors, Campbell, Sprague, Cottrill, and Sullivan (2011) found that 21 of the 32 longitudinal sexual assault studies collected data at two or more follow-up points; the Burgess and Holmstrom (1974) was in the minority of longitudinal sexual assault studies that failed to conduct multiple follow-ups. Given the potential for memory errors, recall biases and the vagueness of the RTS phase parameters previously mentioned, additional data should have been collected in the weeks and months following the rape, similar to other longitudinal studies examining sexual assault outcomes (Feeny, Zoellner, & Foa, 2000; Gidycz et al., 2001; Kilpatrick, Veronen, & Resick, 1979).

It Has Not Undergone Subsequent Scientific Evaluation

A study is strengthened by follow-up data, but the strength of a study ultimately depends on the ability of its findings to be replicated (Francis, 2012). Findings that cannot and/or have not been replicated cannot be interpreted as reliable or valid. Since the study by Burgess and Holmstrom (1974), there have been no replications of the study findings. Holmstrom (1975) utilized the same sample of women from the original study RTS study and described the participants' experiences of reporting the rape to police, pressing charges and going to trial. Burgess (1983) attempted to describe RTS in greater detail than before, provided a rationale for treatment following rape (which is different from contemporary cognitive-behavioral exposure therapy subsequently found to be the most effective for mitigating the common anxiety disorders that most frequently follow rape; Foa et al., 1999) and discussed RTS in the context of expert testimony, but no additional empirical data on RTS was provided. Lauderdale (1984) and McCord (1985) referenced a study by Sutherland and Scherl (1970) as generally supportive evidence of the RTS construct and the admissibility of expert testimony on RTS, but Sutherland and Scherl (1970) described a three-stage model of stress reaction following rape and this study was published before the term rape trauma syndrome was even coined by Burgess and Holmstrom (1974).

Furthermore, reviews regarding the admissibility of RTS in expert testimony (i.e., Lauderdale, 1984; McCord, 1985; Raum, 1983) suggest numerous studies (e.g., Atkeson, Calhoun, Resick, & Ellis, 1982; Ellis, Atkeson, & Calhoun, 1981; Kilpatrick et al., 1979; J. Norris & Feldman-Summers, 1981; Resick, Calhoun, Atkeson, & Ellis, 1981) support the validity of RTS. However, these studies are general investigations of reactions following sexual assault, not direct replications of the Burgess and Holmstrom (1974) study or extensions of the RTS literature. In general,

they are not supportive because most of these studies do not find support for the two-stage model and find the problems experienced by sexual assault victims much more in line with DSM diagnoses such as acute stress disorder (ASD), PTSD and major depressive episode. For example, Atkeson and colleagues (1982) examined depressive symptoms in rape victims, not stress reactions. Also worth noting is the lack of recent investigations supporting the validity of RTS; all the above studies that have been cited as supporting the validity of RTS are over 30 years old.

There are Theoretical Allegiance Effects

Confirmation biases can occur through hypothesis-determined information seeking and interpretation, overweighting of positive confirmatory instances and underweighting of negative confirmatory instances, especially in unstructured interviews like those conducted by the authors (Nickerson, 1998). Frequently used techniques for mitigating the effects of confirmation biases are blind or double-blind experimental protocols (Gluud, 2006). As stated previously, the Burgess and Holmstrom (1974) study was prone to confirmation biases because the authors conducted all of the study interviews and obviously were not blind to their own hypotheses. To this day, the validity of RTS symptomology has never been examined using blind interviewers or interviewees.

It Has a Better Competitor

The nature of science involves hypotheses that are accepted until falsified or until a superior hypothesis is found (Hempel, 1966; Popper, 1957). The RTS has been compared with a PTSD model in the literature (Block, 1990; Boesch, Sales, & Koss, 1998; McGowan & Helms, 2003). Unlike RTS, empirical examination of the PTSD model has been extensive, both conceptually and empirically (DiGangi et al., 2013; Watts et al., 2013). As a result, PTSD does not

possess the same conceptual vagueness as RTS and the diagnostic criteria for PTSD are clearly outlined in the DMS-V (APA, 2013). In addition, PTSD does not exclusively pertain to adult females and contains child-specific criteria for trauma such as child abuse. Unlike RTS, PTSD is not limited to sexual assault stress reactions, but can arise from a variety of events that produce feelings of intense fear, helplessness or horror (APA, 2000, 2013) and thus has wider scope and generality. Furthermore, PTSD does have the same questionable evidential status as RTS. Empirically supported measures of PTSD symptoms include the Clinician Administered PTSD Scale (CAPS) and the Posttraumatic Stress Disorder Checklist (PCL), which have been shown to correctly identify 80–90% of people who have PTSD (Blake et al., 1995; F. H. Norris & Riad, 1997; Weathers, Litz, Herman, Huska, & Keane, 1993; Wilkins, Lang, & Norman, 2011). No widely accepted measures of RTS symptoms exist and, therefore, the error rate of RTS categorization is unknown. Finally, there are empirically supported treatments for PTSD including prolonged exposure therapy and other forms of cognitive-behavioral therapy (Chambless & Hollon, 1998; Ponniah & Hollon, 2009). Because RTS was not derived from scientific research, there are no empirically supported treatments for RTS. Therefore, unlike a PTSD diagnosis, a RTS diagnosis offers very little treatment utility.

It Has Not Achieved a Consensus in the Field

Multiple replications of a finding necessitate acceptance in a given scientific field. Acceptance within a field has both research and legal implications. As previously stated, the Frye test (1923) states that scientific techniques used in expert witness testimony should be generally accepted by the relevant scientific community. Frazier and Borgida (1988) found little agreement among experts regarding the following item: “A coherent and internally consistent body of knowledge on the

aftereffects of rape currently exists". However, since this time, a great deal of trauma research has been conducted, none of which has been in regards to the validity of RTS. There has never been a direct replication of the Burgess and Holmstrom (1974) study. There are no common assessment instruments with acceptable validity that can be used to assess for RTS and, therefore, there is no reliable and valid method for clinicians to identify the presence or absence of RTS. Biggers and Yim (2003) stated that although the last three versions of the DSM categorize sexual assault as an event that may cause PTSD, this does not distinguish RTS as a distinct clinical disorder. RTS is not nor has it ever been included in the DSM (APA, 2000, 2013). Obviously, there are scientific psychological phenomena that are not included in that DSM. A clinical and relevant example is the construct of complex PTSD (CPTSD), which refers to symptoms associated with prolonged or repeated traumatic experiences (1992). CPTSD is not included in the DSM-V. However, CPTSD is arguably different from RTS because it has been examined in numerous empirical studies (Resick et al., 2012). Experts may speak of CPTSD due to its presence in the scientific literature; the same is not true for RTS.

Is It Not Falsifiable

All scientific hypotheses or theories must be falsifiable (Popper, 1957). That is, it must be possible to conceive an observation that demonstrates the hypothesis in question to be false. Theories or hypothesis that cannot be falsified impede the progression of science. RTS is not falsifiable for the following reasons: (1) some of the major constructs of RTS are unclear, (2) the symptoms constellation purportedly involved in RTS is unclear, (3) measurement operations of RTS are unclear and (4) RTS does not make quantified assertions but rather vague qualitative ones. As stated previously, it is not apparent whether RTS is a phase model of stress or a

collective set of symptoms. Therefore, merely observing the absence of the acute phase or long-term phase cannot falsify the theoretical construct of RTS. Identifying the absence of certain symptoms is also not an adequate falsification because RTS possesses no necessary or sufficient diagnostic criteria. Identifying symptoms not included in the previously described "characteristic" set of symptoms of RTS is not adequate because according to Burgess and Holmstrom (1974), observed victim symptoms vary widely. In fact, the authors suggest that both the presence and absence of emotional reactivity is characteristic of RTS. In addition, there is no empirically supported measure or measures to assess the presence or absence of RTS symptoms, further emphasizing the inability to falsify RTS and the problematic scientific nature of RTS. The circumstances of effective treatment for RTS cannot be identified and the circumstances under which RTS occurs cannot be identified – thus it has at best very limited treatment utility. Finally, quantitative assertions are most falsifiable (e.g., "77% of rape victims meet the diagnostic criteria for major depressive episode"). The RTS contains no such quantitative assertions; rather the assertions are vague and qualitative (e.g., "Some victims will experience some symptoms at some time"). Such statements are much more difficult to falsify because it is not clear what observable states of affairs these actually exclude (O'Donohue, Benuto, & Cirluega, 2013).

Other General Problems

It Is Inconsistent With Other Empirical Studies of Post-Trauma Sequelae

It is well documented that reactions following a potentially traumatic experience (PTE) vary widely. Although many individuals are exposed to PTEs, it is estimated that only 6.8% of American adults meet the diagnostic criteria for PTSD (Kessler et al., 2005). However, some general patterns and/or comorbidities have been observed in individuals who

experience post-traumatic stress. An ASD diagnosis has been found to be a significant predictor for PTSD diagnosis in victims of violent crime (Brewin, Andrews, Rose, & Kirk, 1999). While RTS has been compared with PTSD in the literature (Block, 1990; Boeschel et al., 1998; McGowan & Helms, 2003), ASD has been ignored. The phases of RTS are far more ambiguous than the observed relationship between ASD and PTSD and no predictive relationship has been examined (Burgess & Holmstrom, 1974). Furthermore, RTS does not account for other psychopathology observed following a trauma. It has been found that 83% of individuals who develop PTSD also meet criteria for at least one other psychiatric disorder (Breslau, Davis, Andreski, & Peterson, 1991). In fact, major depression occurs at a similar rate to PTSD after trauma (Kessler et al., 1995, 2005). Generalized anxiety disorder (GAD) has also been found to be highly comorbid with PTSD; Kessler et al. (2005) found PTSD and GAD to be significantly positively correlated (.44). Additionally, the prevalence of substance use disorders has been estimated at between 22 and 43% in individuals with PTSD compared with between 8.1 and 24.7% in individuals without PTSD (Breslau et al., 1998; Kessler et al., 1995, 2005).

Finally, post-trauma sequelae have been shown to involve relationship problems and sexual dysfunction. In a meta-analysis of PTSD and intimate relationship problems, Taft, Watkins, Stafford, Street, and Monson (2011) found medium-sized true score correlations between PTSD and intimate relationship discord ($p = .38$), intimate relationship physical aggression perpetration ($p = .42$) and intimate relationship psychological aggression perpetration ($p = .36$). Furthermore, sexual dysfunctions documented following trauma include: a lack of desire, decreased satisfaction, orgasmic dysfunction and increased likelihood of engaging in risky sexual behavior (Cosgrove et al., 2002; Dekel & Solomon, 2006; Green et al., 2005; Hutton et al., 2001; Kotler et al., 2000; Letourneau, Resnick,

Kilpatrick, Saunders, & Best, 1996). While Burgess and Holmstrom (1974) vaguely describe lifestyle disorganization and sexual fears, it is clear that RTS is an incomplete conceptualization of post-trauma sequelae based on the literature reviewed above.

It Ignores Subject × Variable Interactions

Researchers often examine the simultaneous influence of two or more independent variables on a dependent variable. Even when interactions are not the primary interest of researchers, unmovable independent variables (e.g., demographic variables) necessitate the examination of interactions. Although Burgess and Holmstrom (1974) described their sample in terms of age, ethnicity, socioeconomic status (SES), occupational status, marital status and number of children, they failed to examine how these participant characteristics relate to or interact with observed RTS symptoms. This is problematic because the literature suggests that there are a number of personal variables that have been shown to increase an individual's vulnerability to experiencing post-traumatic distress including: lower intelligence, lower SES and a lack of social support (Breslau, Lucia, & Alvarado, 2006; Milan, Zona, Acker, & Turcios-Cotto, 2013). Furthermore, Burgess and Holmstrom (1974) did not assess individual personality traits. Personality traits and trauma intensity have been shown to account for up to 43% of the variance in PTSD severity with a notable significant interaction between trauma intensity and neuroticism (Lauterbach & Vrana, 2001). RTS cannot be assumed to be exclusively caused by rape. It is equally likely the symptoms are the result of a participant variable and event interaction.

It Ignores Possible Mediators

Similar to examining interactions, mediational analyses allow researchers to examine the role of a third explanatory variable, determining what variable(s) or mechanism(s) influences

the relationship between an independent variable and a dependent variable. Despite being a longitudinal study, Burgess and Holmstrom (1974) did not examine what variables may mediate the relationship between the rape and observed RTS symptoms. For instance, there was no information regarding whether participants did or did not receive any type of treatment between the initial interview and follow-up a year later. Furthermore, there was no way of knowing how treatments influenced the relationship between rape and RTS symptom severity. No information was presented regarding the mediational roles of social support and coping styles, which have both been shown to relate to PTSD symptom development and severity (Ullman, Relyea, Peter-Hagene, & Vasquez, 2013; Wright, Kelsall, Sim, Clarke, & Creamer, 2013). Given that there are empirically supported treatments for post-traumatic distress and mediators have been identified in the trauma literature, RTS is an oversimplified depiction of traumatic stress reactions.

It Is Not Culturally Sensitive

There has been a recent shift in the assessment and treatment of psychopathology, which questions the use of standard assessment and treatment strategies with ethnic minority members due to an underrepresentation of ethnic minorities in outcome research (Bernal & Scharró-del-Río, 2001). These criticisms and other similar concerns refer to cultural sensitivity. There is no literature on the cultural sensitivity of RTS. Burgess and Holmstrom (1974) described their sample as “a fairly equal number of black and white women and a smaller number of Oriental, Indian, and Spanish-speaking women” (p. 981, no number specified). This is problematic due not only to the pejorative terms, but also to the underrepresentation of Hispanic women, because Hispanics constitute the largest and fastest growing minority group in the United States (U.S. Census Bureau, 2012). Furthermore, Burgess and Holmstrom (1974) failed

to describe how RTS symptoms differed across ethnicities. This is problematic because members of different cultures report different symptoms of the same disorder (e.g., somatic versus cognitive symptoms of depression; Kirmayer, 2001).

It Should Not Be Used to Infer That Rape Has or Has Not Occurred

In addition to the conceptual, evidential and other general problems outlined above, RTS provides no meaningful basis to “diagnose” whether rape has occurred. It is important to note that the authors do not claim that RTS should be used in this manner. The data provided in the original RTS study did not provide any basis to identify markers of true versus false reports of rape. Because no false reports of rape were even examined in the original study such findings are indeed impossible from the original study. In addition, because no determination was made to gain additional assurance that rape indeed had occurred, few if any quantitative relations of symptoms or stages were provided. There can be many other pathways to the symptoms found (other trauma, past childhood abuse, etc.). These symptoms were not shown in the original study to be unique to rape. Thus, it would be improper to reason backward in an attempt to conclude that because features of the RTS were or were not found in an individual case that the person was or was not raped.

RTS in Light of Daubert, Frye and Kelly–Frye Standards

RTS is a problematic construct in forensic settings due to a lack of supporting research evidence. Within the legal system, psychological theories and techniques must meet certain standards to be considered as evidence in court. The Daubert Standard is currently in use in Federal Courts and in some State Courts (Daubert, 1993; Daubert Standard, n.d.). This standard requires that a judge assess

whether or not an expert can give scientific testimony about a particular phenomenon by mandating that this testimony be based on sound reasoning or methodology and must be scientifically valid. In determining whether the methodology is sound, the judge considers five factors: (1) has the theory or technique under question been tested or can it be tested, (2) has the theory or technique been subjected to peer review and publication, (3) what is the theory or technique's potential or known error rate, (4) what are the standards controlling how this theory or technique is implemented and (5) is the theory or technique widely accepted within the relevant scientific community? Through a review of the RTS literature, the current article has demonstrated how RTS fails to meet all five of the factors.

Although much more vague, some State Courts still use the older Frye Standard instead of the Daubert Standard. The Frye Standard states that any novel scientific evidence must be established and generally accepted in its field before it can be presented in court (Frye Standard, n.d.). The trial judge must hear preliminary testimony from experts in the field regarding the specific theory or technique and then decides whether there is substantial support for the theory or technique under question and thus whether it should be allowed in court. Because of its ambiguity, lack of evidential status and the other general problems described above, RTS fails to meet even the more liberal Frye stand of expert testimony admissibility.

Finally, the Kelly–Frye Standard, used in California, is a modification of the original Frye Standard. These modifications require that the theory or technique under question must satisfy three criteria to be used in court in an expert's testimony. These three criteria are: (1) the theory or technique is established enough to have gained general acceptance in its field, (2) testimony about the theory or technique is given by a sufficiently qualified expert and (3) proper scientific procedures have been used in the particular case under

examination (Tyler, 1995). RTS is not in the DSM-V, nor is it included in the International Classification of Diseases. In addition, it has not been adopted by any organization (e.g., the American Psychological or Psychiatric Associations). Because RTS is not a product of rigorous scientific research, there can be no scientifically qualified experts or proper scientific techniques that would qualify RTS to be used in expert testimony.

Conclusions

RTS is meant to address an important question: What are people's reactions to being sexual assaulted? This is a complex question because individuals vary along many critical pre-abuse dimensions; the sexual assault varies along many key dimensions; and there are cotemporaneous mediating variables. However, this question is both an important scientific question and a critical clinical question because it is relevant to treatment planning. However, due to the original study's multiple methodological problems, lack of valid ways to measure RTS and a lack of subsequent research directly evaluating RTS, the evidentiary status of RTS has been and continues to be quite problematic. We recommend that it not be used in the courtroom. There is no evidence that it can be used to validly discriminate women who are truthfully versus falsely alleging that they have been raped. That is, there is no scientific evidence regarding RTS that demonstrates that the extent to which a particular woman seems to meet some of the symptoms involved in RTS has any bearing on whether her claims are true or false. It is recommended that each woman who has been sexually assaulted be carefully assessed and her unique range of diagnoses and problems be identified and a treatment plan based on these be developed.

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