# Assessment of Stress-Buffering Effects of Uplift Events on Overwhelmed Teenagers from Microblogs

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**Abstract**

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## 1. Introduction

*Stress.* Life is always full of ups and downs. The serious mental health problems caused by stress has become hot issues that are widely concerned around the world. According to the newest report of American Psychological Association, the youngest adults are most likely of all generations to report poor mental health in America, and 91 percent of Gen-Zs between ages 18 and 21 say they have experienced physical or emotional symptom due to stress in the past month compared to 74 percent of adults overall (APA, 2018). Accumulated stress comes from daily hassles, major stressful events and environmental stressors could drain people's inner resources, leading to psychological maladjustment, ranging from depression to suicidal behaviours (Nock et al., 2008). Nowadays more than 30 million Chinese teenagers are suffering from psychological stress, and nearly 30% have a risk of depression (Youth and Center, 2019).

*Stress-buffering.* Restoring is an essential process in human's stress coping system (Susan, 1984) to help get out of overwhelmed status. Traditional psychology research shows that stress-restoring could function through various ways, including exercise[xx], self-esteem [xx], changing environments [xx], chatting with friends [xx], writing diaries [xx] and so on. The specific restoring restoring mode remains to be further explored.

With the epidemic of social media among adolescents, it provides a new channel for timely and non-invasive exploration of users' mental health status. Previous studies have shown that it is feasible and reliable to detect user's psychological stress and stressor events, and predict future psychological stress trends through social network data. However, research on stress-buffering effects of uplift events from social networks still calls for more exploration. This article will explore the restoring impact of uplift events from microblogs, help scheduling positive interventions, and predict future stress.

## 2. Literature review

### 2.1. *Restorative function of positive life events.*

Positive life events are conceptualized as exerting a protective effect on emotional distress in psychological literature (Cohen et al., 1984; Needles and Abramson, 1990). Many psychological researchers have focused on the restorative function of positive events with respect to physiological, psychological, and social coping resources. (Folkman and Moskowitz, 2010) identified three classes of coping mechanisms that are associated with positive emotion during chronic stress: positive reappraisal, problem-focused coping, and the creation of positive events. The author also considered the possible roles of positive emotions in the stress process, and incorporated positive emotion into a revision of stress and coping theory in the work (Folkman, 1997). They conducted a longitudinal study of the care giving partners of men with AIDS and described coping processes that were associated with positive psychological states in the context of intense distress.

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The protective effect of uplift events was hypothesized to operate in both directly (i.e., more positive uplift events people experienced, the less distress they experience) and indirectly ways by 'buffering' (Cohen and Hoberman, 2010). In the direct way, the more positive uplift events people experienced, the less distress they experience. While in the indirectly way, positive life events play its role by buffering the effects of negative events on distress. A pioneer experiment conducted by Reich and Zautra provided enlightening evidence for us (Shahar and Priel, 2002). In this experiment, sampled college students who reported initial negative events were encouraged to engage in either two or twelve pleasant activities during one-month, and compared with students in the controlled group experiencing no pleasant activities. Results indicated that participants in the two experimental groups reported greater quality of life compared with controlled students, and participants who engaged in twelve uplift events exhibited lower stress compared with whom engaging two or none uplifts, implicating the protective effect of uplift events on adolescents.

Positive events are verified as protective factors against loneliness, suicide, daily stressors, depression and helping improve health. (Chang et al., 2015) investigated the protective effect of positive events in a sample of 327 adults, and found that the positive association between loneliness and psychological maladjustment was found to be weaker for those who experienced a high number of positive life events, as opposed to those who experienced a low number of positive life events. This is assistant with the conclusion made by (Kleiman et al., 2014) that positive events act as protective factors against suicide individually and synergistically when they co-occur, by buffering the link between important individual differences risk variables and maladjustment. Through exploring naturally occurring daily stressors, (Ong et al., 2006) found that over time, the experience of positive emotions functions to assist high-resilient individuals to recover effectively from daily stress. In the survey made by (Santos et al., 2013), strategies of positive psychology are checked as potentially tools for the prophylaxis and treatment of depression, helping to reduce symptoms and for prevention of relapses. Through a three-week longitudinal study, (Bono et al., 2013) examined the correlation between employee stress and health and positive life events, and concluded that naturally occurring positive events are correlated with decreased stress and improved health.

Due to the immature inner status and lack of experience (Vitelli, 2014), young people exhibit more exposure to uplift events compared with adults, such as satisfying social interactions, excellent academic performance and pleasant entertainments. Researchers indicate that positive events mitigate the relation between negative events and maladjustment in samples of adolescents experiencing family transitions (Doyle et al., 2003). The written expression of positive feelings has also be shown to prompt increased cognitive re-organization among an undergraduate student group (Coolidge, 2009). Positive uplifts can not only help reinforce adolescents' sense of well-being, help restore the capacity for dealing with stress, but also have been linked to medical benefits, such as improving mood, serum cortisol levels, and lower levels of inflammation and hyper coagulability (Jain et al., 2010). Through examining the relationship between self-reported positive life events and blood pressure in 69 sixth graders, researchers found that increased perceptions of positive life events might act as a buffer to elevated blood pressure in adolescents (Caputo et al., 1998).

H1: Positive events could buffer teen's psychological stress.

H2: High frequency of positive events better relieve stress.

H3: Positive events could predict teen's future stress.

### 2.2. *Assessment of Stress-buffering Effects of Positive Events*

*Measuring the Impact of Uplift Events with traditional psychology scales.* To measure the impact of uplift events, Doyle *et al.* Kanner et al. (1981) conducted *Hassles and Uplifts Scales*, and concluded that the assessment of daily hassles and uplifts might be a better approach to the prediction of adaptational outcomes than the usual life events approach. Silva *et al.* Silva et al. (2008) presented the *Hassles & Uplifts Scale* to assess the reaction to minor every-day events in order to detect subtle mood swings and predict psychological symptoms. To measure negative interpretations of positive social events, Alden *et al.* Alden et al. (2008) proposed the interpretation of positive events scale (*IPES*), and analyzed the relationship between social interaction anxiety and the tendency to interpret positive social events in a threat-maintaining manner. Mcmillen *et al.* Mcmillen and Fisher (1998) proposed the *Perceived Benefit Scales* as the new measures of self-reported positive life changes after traumatic stressors, including lifestyle changes, material gain, increases in selfefficacy, family closeness, community closeness, faith in people, compassion, and spirituality. Specific for college students, Jun-Sheng *et al.* Jun-Sheng (2008) investigated in 282 college students using the *Adolescent Self-Rating Life Events*

*Checklist*, and found that the training of positive coping style is of great benefit to improve the mental health of students. Previous exploration for the protective effect of uplift events on adolescents are mostly conducted in psychological area, relying on traditional manpower-driven investigation and questionnaire. The pioneer psychological researches provide us valuable implications and hypothesis, while limited by labor cost, data scale and single questionnaire based method.

*Sensing adolescent stress from social networks.* With the high development of social networks, researches explored applying psychological theories into social network based stress mining, offering effective tools for adolescent stress sensing. As billions of adolescents record their life, share multi-media content, and communicate with friends through such platforms, e.g., Tencent Microblog, Twitter, Facebook and so on, researchers tend to digging psychological status from the self-expressed public data source. Xue *et al.* Xue et al. (2013, 2014) proposed to detect adolescent stress from single microblog utilizing machine learning methods by extracting stressful topic words, abnormal posting time, and interactions with friends. Lin *et al.* Lin et al. (2014) construct a deep neural network to combine the high-dimensional picture semantic information into stress detecting. Based on the stress detecting result, Li *et al.* Li et al. (2015a)Li et al. (2015b)Li et al. (2015c) adopted a series of multi-variant time series prediction techniques (i.e., Candlestick Charts, fuzzy Candlestick line and SVARIMA model) to predict the future stress trend and wave. Taking the linguistic information into consideration, Li *et al.* Li et al. (2017a) employed a NARX neural network to predict a teen's future stress level referred to the impact of co-experiencing stressor events of similar companions. To find the source of teens' stress, previous work Li et al. (2017b) developed a frame work to extract stressor events from microblogging content and filter out stressful intervals based on teens' stressful posting rate. All above pioneer work focused on the generation and development of teens' stress, providing solid basic techniques for broader stress-motivated research from social networks. Based on such research background, this paper starts from a completely new perspective, and focuses on the buffering effect of positive events on restoring stress. Thus we push forward the study from how to find stress to the next more meaningful stage: how to deal with stress.

### 2.3. Correlation analysis for multivariate time series

Basic correlation analysis methods on time series focused on univariate data have been well studied. As the most widely adopted method, the Pearson correlation analysis Cohen et al. (1988) measures the linear correlation between two variables $X$ and $Y$. One inevitable defect is that Pearson correlation is too sensitive to outlier values. To overcome such drawback, Spearman Rank correlation Spearman (1987) and Kendall Rank correlation Mcleod (2011) are proposed based on Pearson correlation. While Pearson correlation estimates linear relationships, Spearman correlation estimates monotonic relationships (whether linear or not), and are calculated as the Pearson correlation between the rank values of two variables. The Kendall correlation mainly assesses the similarity of the orderings of the data when ranked by each of the quantities. The above correlation methods are usually used to estimate relationship between single-dimensional variables, and cannot be adopted directly in our microblog content based scenario.

For multivariate time series analysis, two-sample based methods are widely adopted. Such kind of methods are deduced to check whether two samples come from the same underlying distribution, which is assumed to be statistically unknown. Correspondingly, various kernel Scholkopf et al. (2006) and distance-based methods Schilling (1986) (e.g., the nearest neighbor based method two-sample method) are proposed. Scholkopf *et al.* Scholkopf et al. (2006) proposed to transform the distance between two variables and nearest neighbors into a reproducing kernel Hilbert space (RKHS), and solve the problem using Maximum Mean Discrepancy. In work Schilling (1986), Schilling *et al.* adopted the $r$-nearest neighbor based method to partition two set of event driven time series data. The global proportion of the right divided neighbors are calculated to estimate whether there exists statistically difference between the two sets. We use the $r$-nearest neighbor based two-sample method in our problem, thus to measure the distance and correlation between two multi-dimension variables.

## 3. Current study

In this paper, we aim to continually mine the restoring impact of uplift events leveraging abundant data source from microblogs, to further provide guidance for school and parents that when and which kind of uplift events could help relieve students' overwhelmed stress in both stress prevention and stress

early stopping situations. To model such a practical application problem, several challenges exist. 1) How to extract uplift events from microblogs and identify corresponding impact interval? The impact of uplift events is highlighted when the teen is under stress, with various relative temporal order. Extracting such scenarios from teen's messy microblogs is the first and basic challenge for further analysis. 2) How to qualitatively and quantitatively measure the restoring impact conducted by uplift events? There are multiple clues related to teens' behaviours from microblogs, i.e., depressive linguistic content, abnormal posting behaviours. The teen might act differently under similar stressful situations when the uplift event happens or not. It is challenging to find such hidden correlation between uplift events and teen's behavioural characters.

Moreover, for different types of uplift events, the restoring impact might be different. And for each individual, the protective and buffering effect for stress might also varies according to the personality. All these questions guide us to solve the problem step by step.

In this paper, we first conduct a case study on real data set to observe the posting behaviours and contents of stressful teens under the influence of uplift events. We conduct the case study on the real data set of 124 high school students associated with the school's scheduled uplift and stressor event list. Several observations are conducted to guide the next step research. Next, we extract uplift events and the corresponding impacted interval from microblogs. We define and extract structural uplift events from posts using linguistic parser model based on six-dimensional uplift scale and LIWC lexicons. Independent stressful intervals (SI) and stressful intervals impacted by uplifts (U-SI) are extracted considering temporal orders. To quantify the restoring impact of uplift events, we describe a teen's stressful behaviours in three groups of measures (stress intensity, posting behaviour, linguistic), and model the impact of uplift events as the statistical difference between the sets of SI and U-SI in two aspects: the two-sample based method is employed for variation detection, and the t-test correlation is conducted to judge the monotonous correlation.

## 4. Method

*4.1. Sample*

*4.2. Variables*

*4.3. Research model*

## 5. Results

## 6. Discussion

## 7. Conclusion

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