The tendency to appraise stressful situations as more of a threat is associated with poorer health and well-being

Ella McLoughlin¹,² | Rachel Arnold¹ | Lee J. Moore¹

¹Department for Health, University of Bath, Bath, UK
²School of Science and Technology, Nottingham Trent University, Nottingham, UK

Abstract

It has been argued that habitually appraising stressful events as more of a threat (i.e., situational demands exceed personal coping resources) may increase one’s risk of ill-health (e.g., depression). However, while first theorized 15 years ago, little research has tested this assertion. Thus, this study offered a novel test of the associations between trait challenge and threat appraisals and health-related outcomes (i.e., mental health symptomology, psychological well-being, and physical health complaints). Three hundred and ninety-five participants (251 female, 144 male; M_age = 22.50 years, SD = 5.33) completed valid and reliable measures of trait challenge and threat appraisals, mental health (i.e., symptoms of depression and anxiety), well-being (e.g., subjective vitality), and physical health complaints (e.g., respiratory illnesses). Regression analyses revealed that trait challenge and threat appraisals accounted for a significant proportion of variance in all outcomes after controlling for age and gender, with a tendency to appraise stressful events as more of a threat associated with poorer mental health (i.e., greater depression symptomology), well-being (e.g., lower vitality), and physical health (e.g., more respiratory illnesses). Taken together, the findings highlight the importance of trait challenge and threat appraisals for health, although further research is needed using stronger designs (e.g., longitudinal) to enable a more causal understanding.

KEYWORDS
biopsychosocial model, challenge and threat states, cognitive appraisals, immunology, mental health

1 INTRODUCTION

Individuals are regularly exposed to stressors ranging from mundane daily hassles (e.g., being late to a meeting) to major life events (e.g., death of a parent; Epel et al., 2018). The biopsychosocial model (BPSM) offers a potential explanation for why individuals react differently to stressful situations (Blascovich & Tomaka, 1996). According to the BPSM, a challenge appraisal occurs when an individual evaluates that they have sufficient coping resources to meet situational demands (Blascovich, 2008a). In contrast, a threat appraisal occurs when an individual evaluates that situational demands exceed their coping resources (Blascovich, 2008a). Several factors are proposed to influence this demand resource evaluation process (e.g., danger, familiarity, skill, and ability), which is said to be relatively automatic and subconscious (Jamieson, 2017). Drawing on the work of Dienstbier (1989), the BPSM suggests that a challenge appraisal results in a cardiovascular pattern...
of physiological toughness (i.e., increased cardiac output and decreased vascular resistance), while a threat appraisal results in a pattern of physiological weakness (i.e., little change or decreased cardiac output and little change or increased vascular resistance; Seery, 2011). Despite their discrete labels, challenge and threat are viewed in the BPSM as anchors of a single bipolar continuum such that relative differences (i.e., greater vs. lesser challenge or threat) are meaningful and often investigated when exploring relationships with key outcomes (e.g., performance; Seery, 2011).

Research has identified the benefits associated with appraising stressful situations as a more of challenge, as opposed to a threat. For example, compared to a threat appraisal, a challenge appraisal has been associated with superior task performance (Hase et al., 2019), less state anxiety (e.g., Trotman et al., 2018), and more optimal attentional control (Moore et al., 2021). However, despite ample performance-related research (Behnke & Kaczmarek, 2018), to date, relatively little work has investigated how challenge and threat appraisals relate to health (O’Donovan et al., 2012; Tomaka et al., 2018), particularly using Blascovich’s conceptualization (see Ferguson et al., 1999 for an example study linking similar appraisals to health). This is surprising given the BPSMs strong physiological foundation (vs. other appraisal-based theories, e.g., Lazarus & Folkman, 1984) and the propositions of Blascovich (2008b), who argued that repeatedly appraising stressful situations as a threat may lead to ill-health. Indeed, from a mental health viewpoint, he argued that regularly feeling overwhelmed by situational demands and unable to cope could foster psychopathology (e.g., depression) and associated issues (e.g., sleep problems; Blascovich, 2008b). Moreover, from a physical health perspective, he speculated that the greater release of catabolic (e.g., cortisol) versus anabolic (e.g., testosterone) hormones accompanying threat appraisal might reduce immunity and leave individuals more vulnerable to illness (e.g., common colds; Mendes & Park, 2014). Despite some research linking challenge appraisals with better well-being (e.g., Brown et al., 2017), to date, the assertions of Blascovich (2008b) have largely remained untested. Thus, research is needed to aid our understanding of how challenge and threat appraisals relate to health.

Although predominately situation-specific, research has shown that individuals also have a trait-like tendency to appraise stressful situations as more of a challenge or a threat (e.g., Power & Hill, 2010; Rumbold et al., 2020). For instance, Moore et al. (2019) found that a significant proportion of variance in challenge and threat appraisals was attributable to the person component (i.e., 15%). However, to the authors knowledge, little research has connected trait challenge and threat appraisals with health and well-being outcomes (see Tomaka et al., 2018 for an exception). Thus, to extend existing literature and refine pertinent theory (e.g., BPSM), this study investigated if trait challenge and threat appraisals were associated with mental health, psychological well-being, and physical health complaints. Based on the propositions of Blascovich (2008b), it was predicted that a tendency to appraise stressful events as more of a threat would be associated with poorer mental health (e.g., more depressive symptoms), well-being (e.g., lower vitality), and physical health (e.g., more respiratory illnesses). To test these novel research questions and hypotheses, a subset of data were re-analyzed from a previously published study (i.e., McLoughlin et al., 2022).

2 | METHOD

2.1 | Participants

Three hundred and ninety-five participants took part (251 female, 144 male; \( M_{\text{age}} = 22.50 \, \text{years}, \, SD = 5.33 \)). From this sample, 94% (\( n = 372 \)) reported being European, 2% (\( n = 9 \)) North American, 1% (\( n = 5 \)) Asian, and 0.5% (\( n = 2 \)) African. The remainder did not report their nationality (\( n = 7 \)). An a priori power calculation using G*Power software revealed that at least 395 participants were required to run multiple regression analyses. The effect size entered into this calculation was based on the small effect (\( \beta = 0.16 \)) reported by Tomaka et al. (2018) between trait challenge and threat appraisals and depression, and was entered with an alpha of 0.05 and power of 0.80 (McLoughlin et al., 2022).

2.2 | Study design and procedure

This study used a cross-sectional design. After institutional ethical approval (EP 18/19 107), participants were recruited via the research team’s existing contacts, social media (e.g., Twitter), and by distributing study information (e.g., posters). Once recruited, participants were sent a brief survey created using JISC online surveys (https://www.onlinesurveys.ac.uk/). Before completing the survey, participants were informed of their ethical rights (e.g., confidentiality, right to withdraw) via an information sheet and provided informed consent.

2.3 | Measures

2.3.1 | Trait challenge and threat appraisals

The Appraisal of Challenge and Threat Scale (ACTS; Tomaka et al., 2018) assessed trait appraisals. Participants were presented with 15 potentially stressful events (e.g., you find out that you have a chronic disease), with each event followed by one item assessing demand evaluations (i.e., how demanding is this event to you?), and one assessing resource evaluations (i.e., how able are you to take action to deal with it?). Both items were scored on a 5-point Likert scale ranging from 1 (not at all) to 5 (very much). Resource evaluations were subtracted from demand evaluations for each event, then a mean score was calculated across all events (range = −4 to +4). Positive scores indicated a tendency to appraise events as more of a threat, while negative scores reflected a tendency to appraise events as more of a challenge. The ACTS is valid and reliable (Tomaka et al., 2018), and in this study Cronbach’s alpha was 0.86. Mean demand evaluation, resource evaluation, and trait challenge and threat appraisal for each potentially stressful event can be viewed in Table S1.

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2.3.2 | Mental health

**Depression.** The Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001) was used to assess symptoms of depression over the last 2 weeks. The PHQ-9 includes nine items (e.g., little interest or pleasure in doing things), with each item scored on a 4-point Likert scale ranging from 0 (not at all) to 3 (nearly every day). Items were summed (range = 0–27), with a higher score indicating greater depressive symptomology. The PHQ-9 is valid and reliable (Kroenke et al., 2001), and in this study Cronbach’s alpha was 0.82.

**Anxiety.** The Generalized Anxiety Disorder scale (GAD-7; Spitzer et al., 2006) was used to assess symptoms of anxiety over the last 2 weeks. The GAD-7 includes seven items (e.g., feeling nervous), with each item scored on a 4-point Likert scale ranging from 0 (not at all) to 3 (nearly every day). Items were summed (range = 0–21), with a higher score reflecting greater anxiety symptomology. The GAD-7 is valid and reliable (Spitzer et al., 2006), and in this study Cronbach’s alpha was 0.88.

2.3.3 | Psychological well-being

The World Health Organization’s Well-being Index (WHO-5) was used to assess well-being over the past 2 weeks. The WHO-5 consists of five items (e.g., I have felt cheerful and in good spirits), with each item scored on a 6-point Likert scale ranging from 0 (not at all) to 6 (all the time). Items were summed (range = 0–30), and the total was then multiplied by four (range = 0–120), such that a higher score represented greater well-being. The WHO-5 is valid and reliable (Topp et al., 2015), and in this study Cronbach’s alpha was 0.80.

2.3.4 | Physical health complaints

The PHQ (Schat et al., 2005) was used to assess physical health complaints over the past month. The PHQ includes 14 items assessing sleep disturbances, headaches, and respiratory infections. Responses to 11 of the items (e.g., how often have you had difficulty getting to sleep at night?) were scored on a 7-point Likert scale ranging from 0 (not at all) to 7 (all the time), responses to two items (e.g., how many times have you had minor colds?) were scored on a 7-point Likert scale ranging from 0 times to 7+ times, and one item (e.g., when you had a bad cold or flu, how long did it typically last?) was scored on a 7-point Likert scale ranging from 1 day to 7+ days. Items were summed (range = 12–98), with a higher score indicating more physical health complaints. The PHQ is valid and reliable (Schat et al., 2005), and in this study Cronbach’s alpha was 0.80.

2.4 | Data analysis

Data were analyzed using SPSS version 28.0. First, checks revealed no missing data but that all data were non-normally distributed (i.e., skewness and kurtosis z-scores >1.96). Seven outliers were revealed (i.e., z-scores greater or lesser than 3.29), and thus square root transformations were performed which ensured all data were normally distributed. Checks for other statistical assumptions were satisfied (e.g., linearity, homoscedasticity, multicollinearity). Second, descriptive statistics (i.e., means, SDs) for, and correlations between, all study variables were computed (see Table 1). Third, bivariate linear regression analyses were conducted to examine if trait challenge and threat appraisals accounted for a significant proportion of variance in health outcomes (i.e., symptoms of depression and anxiety, psychological well-being, and physical health complaints; see Table 2, Model 1). Finally, hierarchical linear regression analyses were performed to investigate if trait challenge and threat appraisals still accounted for a significant proportion of variance in health outcomes after controlling for age and gender (see Table 2, Model 2).

To account for multiple comparisons, Bonferroni correction was applied, with the corrected alpha set at \( p = 0.006 \). In follow-up analyses, the regression models were repeated for evaluated demands and resources, and these results are presented in Tables S2 and S3.

| TABLE 1 | Means, SDs, and intercorrelations (Pearson’s r) for all variables. |
|---|---|---|---|---|---|---|
|   | Mean | SD  | 1 | 2 | 3 | 4 | 5 |
| 1. Trait challenge and threat appraisals | −0.34 | 1.11 | - | | | | |
| 2. Depression symptoms | 6.10 | 4.44 | 0.32*** | - | | | |
| 3. Anxiety symptoms | 5.37 | 4.40 | 0.37*** | 0.70*** | - | | |
| 4. Psychological well-being | 60.21 | 15.94 | −0.23*** | −0.50*** | −0.40*** | - | |
| 5. Physical health complaints | 33.31 | 10.84 | 0.37*** | 0.52*** | 0.37*** | −0.23*** | - |

* \( p < 0.05 \); ** \( p < 0.01 \); *** \( p < 0.001 \).

3 | RESULTS

3.1 | Symptoms of depression

Trait challenge and threat appraisals accounted for a significant proportion of variance in symptoms of depression \( R^2 = 0.11, \beta = 0.33, p < 0.001 \), an effect that remained statistically significant after controlling for age and gender \( \Delta R^2 = 0.01, \beta = 0.32, p < 0.001 \).
### 3.2 Symptoms of anxiety

Trait challenge and threat appraisals accounted for a significant proportion of variance in symptoms of anxiety ($R^2 = 0.14$, $\beta = 0.37$, $p < 0.001$), an effect that remained statistically significant after controlling for age and gender ($\Delta R^2 = 0.01$, $\beta = 0.34$, $p < 0.001$).

### 3.3 Psychological well-being

Trait challenge and threat appraisals accounted for a significant proportion of variance in psychological well-being ($R^2 = 0.05$, $\beta = -0.23$, $p < 0.001$), an effect that remained statistically significant after controlling for age and gender ($\Delta R^2 = 0.02$, $\beta = -0.25$, $p < 0.001$).

### TABLE 2

Bivariate and hierarchical linear regression models examining if trait challenge and threat appraisals accounted for a significant proportion of variance in (a) symptoms of depression, (b) symptoms of anxiety, (c) psychological well-being, and (d) physical health complaints before (Model 1), and after (Model 2), controlling for age and gender.

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
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<tr>
<td></td>
<td>$B$</td>
<td>SE $B$</td>
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<tr>
<td>(a) Depression symptoms</td>
<td></td>
<td></td>
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<tr>
<td>ACTS</td>
<td>1.31</td>
<td>0.19</td>
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<tr>
<td></td>
<td>(0.93 to 1.67)</td>
<td></td>
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<tr>
<td>Age</td>
<td>-0.07</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td>(-0.14 to 0.01)</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>0.12</td>
<td>0.46</td>
</tr>
<tr>
<td></td>
<td>(-0.78 to 1.01)</td>
<td></td>
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<tr>
<td>(b) Anxiety symptoms</td>
<td></td>
<td></td>
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<tr>
<td>ACTS</td>
<td>1.45</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>(1.09 to 1.82)</td>
<td></td>
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<tr>
<td>Age</td>
<td>-0.03</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td>(-0.11 to 0.05)</td>
<td></td>
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<tr>
<td>Gender</td>
<td>0.70</td>
<td>0.45</td>
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<tr>
<td></td>
<td>(-0.18 to 1.57)</td>
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<tr>
<td>(c) Psychological well-being</td>
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<tr>
<td>ACTS</td>
<td>-3.23</td>
<td>0.70</td>
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<tr>
<td></td>
<td>(-4.62 to -1.85)</td>
<td></td>
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<tr>
<td>Age</td>
<td>0.24</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>(-0.05 to 0.53)</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>3.45</td>
<td>1.68</td>
</tr>
<tr>
<td></td>
<td>(0.17 to 6.77)</td>
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<tr>
<td>(d) Physical health complaints</td>
<td></td>
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<tr>
<td>ACTS</td>
<td>3.64</td>
<td>0.46</td>
</tr>
<tr>
<td></td>
<td>(2.74 to 4.54)</td>
<td></td>
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<tr>
<td>Age</td>
<td>-0.16</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>(-0.35 to 0.02)</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>5.47</td>
<td>1.06</td>
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<tr>
<td></td>
<td>(3.38 to 7.56)</td>
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Abbreviation: ACTS, appraisal of challenge and threat scale.

*p < 0.05; **p < 0.01, ***p < 0.001, two-tailed.
### 3.4 Physical health complaints

Trait challenge and threat appraisals accounted for a significant proportion of variance in physical health complaints ($R^2 = 0.14$, $\beta = 0.37$, $p < 0.001$), an effect that remained statistically significant after controlling for age and gender ($\Delta R^2 = 0.06$, $\beta = 0.30$, $p < 0.001$).

### 3.5 Discussion

Despite ample research linking state challenge and threat appraisals with performance-related outcomes (see Hase et al., 2019 for a review), relatively little is known about how these appraisals are associated with key health-related outcomes (e.g., depressive symptomology; Blascovich, 2008b). Thus, this study offered a novel test of the relationships between trait challenge and threat appraisals and mental health symptomology, psychological well-being, and physical health complaints. For the first time, the results revealed that habitually appraising stressful events as more of a threat (i.e., situational demands exceed personal coping resources) was associated with poorer mental health, well-being, and physical health than the tendency to appraise events as more of a challenge (i.e., resources match or exceed demands).

As hypothesized, and consistent with the theorizing of Blascovich (2008b), trait challenge and threat appraisals were associated with mental health and psychological well-being after controlling for age and gender, with a tendency to appraise stressful situations as more of a threat linked to greater symptoms of depression and anxiety and lower well-being. These findings are congruent with the limited research conducted to date (e.g., Brown et al., 2017; Tomaka et al., 2018), and imply that the BPSM should move beyond its sole focus on performance and include longer-term outcomes linked to mental health and well-being (Blascovich, 2008a; Seery, 2011). One potential explanation for these findings could be that a threat appraisal is associated with greater distractibility by task-irrelevant, negative, and threatening stimuli (Vine et al., 2016), an attentional bias which is commonly implicated in the aetiology of psychopathology (e.g., anxiety disorders; Clauss et al., 2022). Alternatively, it might be that trait threat appraisals relate to more avoidant forms of coping (e.g., behavioural or mental disengagement), which, overtime, may contribute to mental ill-health and poorer well-being (e.g., Cheng et al., 2023). However, no mechanistic data were collected in this study and so future research is needed to understand precisely how repeatedly appraising stressful situations as more of a threat might negatively impact mental health and well-being.

Beyond mental health, trait challenge and threat appraisals were associated with physical health complaints after controlling for age and gender, such that habitually appraising stressful situations as more of a threat was linked to more headaches, respiratory illnesses, and sleep disturbances. This novel finding supported our hypotheses as well as the assertions of Blascovich (2008b), who speculated that challenge and threat appraisals might have different immunological effects. Specifically, to help explain our findings, Blascovich (2008b) argued that compared to a challenge appraisal, a threat appraisal could result in fewer anabolic hormones being released (e.g., oestrogen, testosterone), which are essential for growth, tissue repair, and protection against infection, thereby making individuals more susceptible to illness (Mendes & Park, 2014). Additionally, Blascovich (2008b) noted that the cardiovascular reactivity pattern accompanying a threat appraisal (i.e., greater vascular resistance), when frequently experienced, might cause more wear and tear on the body, and such stress-related allostatic load has been associated with negative health outcomes (e.g., cardiovascular disease; Guidi et al., 2020). Again, these mechanistic explanations are only speculative, and require testing in future research. However, the present study does show, for the first time, that trait challenge and threat appraisals may be associated with physical health outcomes. Thus, it is important that the BPSM moves beyond its sole focus on performance and can also explain how challenge and threat appraisals impact physical health (Blascovich, 2008a).

Turning from theory to applied practice, the findings suggest that interventions aimed at discouraging threat appraisals may benefit health and well-being. One intervention that might achieve this is the stress optimization approach (Crum et al., 2020), which encourages individuals to view stress generally, and specific stress responses (e.g., elevations in heart rate), as beneficial. Indeed, research has shown that fostering a stress-is-enhancing mindset can limit threat appraisals and improve key outcomes (Jamieson et al., 2018). For instance, in a series of studies, Yeager et al. (2022) found that a synergistic mindset intervention that promoted a stress-is-enhancing mindset as well as a growth mindset towards intelligence attenuated threat-type responses (e.g., lower vascular resistance) and benefited health and well-being (e.g., less anxiety symptomology). Similarly, research has shown that encouraging individuals to interpret stress-fuelled elevations in physiological arousal (e.g., increased breathing rate) as a functional tool can limit threat appraisals and benefit important outcomes (Jamieson et al., 2018). For example, recently, Jamieson et al. (2022) found that a stress arousal reappraisal intervention reduced threat appraisals and boosted academic performance.

Despite the novel findings of this study, several limitations should be noted. First, the study design was cross-sectional, which limits the conclusions that can be drawn. Future research should therefore use longitudinal designs to better understand the causal relationships between brain challenge and threat appraisals and health outcomes (Turner et al., 2020). Second, the study used self-report measures, which could have been influenced by bias (e.g., social desirability). Thus, future studies should examine whether trait challenge and threat appraisals are associated with objective markers of health (e.g., blood pressure; Fuchs & Whelton, 2019). Third, although participants represented a wide range of ages (i.e., 18–63 years), the average age was relatively young (i.e., ~23 years), which could have limited the number of stressors the sample had experienced and thus impacted the results. Future research should therefore collect data from an older and more diverse sample, whereby stronger effects due to the cumulative impact of stress (Epel et al., 2018). Fourth, while we have...
suggested that appraising stressful events as more of a threat may be problematic for health, the data cannot fully confirm this proposition, and it might be that appraising events as less of a challenge leads to poorer health. Indeed, future research should investigate this and other possibilities (e.g., only high challenge appraisals are protective from ill-health), perhaps using more sophisticated statistical analyses (e.g., testing for linear, quadratic, and cubic appraisal-health relationships; Moore et al., 2018). Finally, although symptoms of two common mental health conditions were measured (i.e., anxiety disorder), future research should assess less common disorders and offer a more fine-grained analysis to establish if trait appraisals more strongly predict specific types of disorders (e.g., generalized vs. social anxiety; Shimizu et al., 2011).

In summary, this study offered a novel investigation of the relationships between trait challenge and threat appraisals and health outcomes. The results offer some of the first empirical evidence that a tendency to appraise potentially stressful situations as more of a threat (i.e., situational demands exceed personal coping resources) may be associated with poorer mental health (e.g., greater symptoms of depression), psychological well-being (e.g., lower vitality), and physical health (e.g., more respiratory illnesses). While further research using stronger designs is needed (e.g., longitudinal), the findings suggest that trait challenge and threat appraisals may be worthy of inclusion in theories aimed at explaining how psychological stress relates to health. Additionally, these findings suggest that practitioners should develop challenge-promoting interventions to optimize the health and well-being of individuals.

CONFLICT OF INTEREST STATEMENT
The authors report no conflict of interest.

DATA AVAILABILITY STATEMENT
The data that support the findings of this study are available from the corresponding author (EM) upon reasonable request.

ETHICS STATEMENT
Institutional ethical approval was from the Research Ethics Approval Committee for Health at the University of Bath (EP 18/19 107).

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