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Jodi Martin, Paula F. Cloutier, Christine Levesque, Jean-François Bureau, Marie-France Lafontaine, and Mary K. Nixon

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BRIEF REPORT

Psychometric Properties of the Functions and Addictive Features Scales of the Ottawa Self-Injury Inventory: A Preliminary Investigation Using a University Sample

Jodi Martin
University of Ottawa

Paula F. Cloutier
Children's Hospital of Eastern Ontario, Ottawa, Ontario, Canada

Christine Levesque, Jean-François Bureau, and
Marie-France Lafontaine
University of Ottawa

Mary K. Nixon
University of British Columbia

Nonsuicidal self-injury (NSSI) is an issue primarily of concern in adolescents and young adults. Thus far, no single NSSI self-report measure offers a fully comprehensive assessment of NSSI, particularly including measurement of both its functions and potential addictive features. The Ottawa Self-Injury Inventory (OSI) permits simultaneous assessment of both these characteristics; the current study examined the psychometric properties of this measure in a sample of 149 young adults in a university student sample (82.6% girls, $M_{\text{age}} = 19.43$ years). Exploratory factor analyses revealed 4 functions factors (internal emotion regulation, social influence, external emotion regulation, and sensation seeking) and a single addictive features factor. Convergent evidence for the functions factor scores was demonstrated through significant correlations with an existing measure of NSSI functions and indicators of psychological well-being, risky behaviors, and context and frequency of NSSI behaviors. Convergent evidence was also shown for the addictive features scores, through associations with NSSI frequency, feeling relieved following NSSI, and inability to resist NSSI urges. Additional comment is made regarding the potential for addictive features of NSSI to be both negatively and positively reinforcing. Results show preliminary psychometric support for the OSI as a valid and reliable assessment tool to be used in both research and clinical contexts. The OSI can provide important information for case formulation and treatment planning, given the comprehensive and all-inclusive nature of its assessment capacities.

Keywords: psychometric properties, nonsuicidal self-injury, functions, addictive features

Nonsuicidal self-injury (NSSI) is any purposeful, self-inflicted injury that results in tissue damage and is performed without suicidal intent and through methods that are not socially sanctioned (Nixon & Heath, 2009). Given the prevalence rates for NSSI in both clinical (38%-67%) and community (4%-44%) samples of adolescents and young adults (see Heath, Schaub, Holly, & Nixon, 2009), and the negative societal and individual implications of this behavior (e.g., Muehlenkamp, 2006), research has focused

on the development of effective assessment tools in order to better understand the nature of NSSI. While a number of self-report measures exist for the assessment of NSSI and its related characteristics, there is no one "gold standard" for this area, and there is great variability in the aspects of NSSI assessed between individual assessment tools. For instance, some measures focus only on the frequency of NSSI and on particular types of methods used, while others include additional assessment of individuals' reasons for engaging in NSSI (see Cloutier & Humphreys, 2009; Klonsky & Weinberg, 2009, for reviews). Information regarding the underlying reasons for or functions of NSSI may be of particular use clinically, and thus tools including an assessment of these functions offer significant clinical benefit.

Klonsky (2007) recently conducted a comprehensive review of existing functions theory and research and established seven superordinate functions of NSSI from the literature: affect regulation, self-punishment, antidissociation, interpersonal influence, interpersonal boundaries, sensation seeking, and antisuicide (see Klonsky, 2007, for full descriptions). Despite ample evidence for these overarching functions, most assessments account for only a portion

Jodi Martin, School of Psychology, University of Ottawa, Ottawa, Ontario, Canada; Paula F. Cloutier, Mental Health Research, Children's Hospital of Eastern Ontario, Ottawa, Ontario, Canada; Christine Levesque, Jean-François Bureau, and Marie-France Lafontaine, School of Psychology, University of Ottawa; Mary K. Nixon, Department of Psychiatry, University of British Columbia, Vancouver, British Columbia, Canada.

Correspondence concerning this article should be addressed to Jodi Martin, School of Psychology, University of Ottawa, 136 Jean-Jacques Lussier, Ottawa, ON K1N 6N5, Canada. E-mail: jmart083@uottawa.ca

of them, and there is great variation in which functions are measured between different assessments (see Cloutier & Humphreys, 2009; Klonsky & Weinberg, 2009). Moreover, despite the number of measures assessing NSSI functions, there is still no all-in-one assessment of certain additional characteristics of NSSI behavior that may be especially pertinent in treatment planning and clinical intervention, such as its potential addictive features.

Although much support for NSSI's addictive features comes from case studies or anecdotal evidence (e.g., Conterio & Lader, 1998; Favazza & Rosenthal, 1993), two empirical studies have provided support for these features. Nixon, Cloutier, and Aggarwal (2002) adapted the seven-point criteria for substance dependence given in the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; *DSM-IV-TR*; American Psychiatric Association, 2000) to reflect addictive features of NSSI and showed that 97.6% of their clinical sample of 42 self-injuring adolescents endorsed at least three dependence items (the numerical criteria for substance abuse disorder as per the original *DSM-IV-TR* items). Moreover, 80.1% reported experiencing five or more of the addictive features; more frequent NSSI was also related to more addictive features. Schaub, Holly, Toste, and Heath (2006) used the same seven items in a sample of 56 self-injuring university students and showed that 31% endorsed at least three of the addictive features. Despite this support for the addictive properties of NSSI, Victor, Glenn, and Klonsky (2012) discussed conflicting evidence through comparisons of 40 adolescent drug users with 46 self-injurers (groups not mutually exclusive) based on their self-reported cravings for either drugs or NSSI (measured with same items for both behaviors, switching *drug* for *self-injury*). Results indicated that cravings for drugs were higher than the cravings for NSSI and that, given the reported contexts of cravings for the two behaviors, NSSI was craved primarily in the context of negative emotions. Thus, the authors concluded that this finding was more reflective of NSSI as an emotion-regulating behavior rather than as an addictive one. Given the limited literature regarding addictive features of NSSI, including a lack of any comprehensive, established measurement tool addressing potential addictive properties, an assessment tool composed of items to assess both functions and addictive features of NSSI would permit examination of which functions are especially linked with the addictive properties of NSSI; this would have great implications both empirically and clinically.

The Ottawa Self-Injury Inventory (OSI) is a novel self-report questionnaire for assessing NSSI, as it permits the simultaneous assessment of *both* functions and addictive features of NSSI. The OSI was developed based on a comprehensive literature review, clinical experience, and input from adolescent psychiatric inpatients who had engaged in NSSI, and it features a series of separate scales assessing frequency of recent NSSI thoughts and behaviors, initial and continuing functions of NSSI, addictive features, and additional characteristics of NSSI. Although the OSI has not yet been formally validated, early investigations using the functions and addictive features items demonstrated that a broad range of functions were indicated in a clinical sample of 42 adolescents (Cloutier & Nixon, 2003). There was also high endorsement of addictive features in this sample, justifying additional examination of the psychometric properties of this measure (Nixon et al., 2002).

For the current study, the separate scales assessing initial functions and addictive properties were especially relevant, and their

psychometric properties were examined using data collected from a university student sample. Given the conceptual independence of the functions and addictive features scales (e.g., functions were assessed as reasons for beginning to engage in NSSI while the theory surrounding the development of addictive features of NSSI indicates that these features develop only after extended, long-term engagement) and the fact that the items were pulled from two distinct scales within the OSI, we used two separate factor analyses to examine their internal structures. It was first expected that the obtained factors of the functions scale would mirror the functions from past review (Klonsky, 2007) and that evidence for convergent validity of the function scores would be identified through links with scores on a previously validated measure of NSSI function and by correlating scores on the function factors with theoretically and empirically linked constructs, including psychological well-being, risky behaviors, and other features of NSSI (e.g., frequency, does NSSI occur after stressful experiences?). The internal structure of the addictive features scale was hypothesized to result in a single factor, based on the *DSM-IV-TR* criteria for substance abuse disorders. Evidence for convergent validity of addictive features scores was expected through links with greater frequency of NSSI, feeling relief after NSSI (e.g., Conterio & Lader, 1998), and the ability to resist urges of NSSI (e.g., Favazza & Rosenthal, 1993). Additional convergent evidence for addictive features scores was examined through correlations with scores on the NSSI functions factors. Finally, discriminant evidence of both function and addictive features scores were examined through correlations with age, language (French or English), and gender, none of which were expected to be significant.

Method

A total of 4,705 university students participated in a larger study by completing a package of online questionnaires. Of these students, 169 (4%) reported self-injury in the past 6 months and were included for the current analyses. An additional 20 were excluded from analyses for having one or more missing responses on the functions or addictive features scales of the OSI, leaving a total of 149; all other missing values (none exceeding 5% missing) were estimated with expectation maximization. The majority of the included participants were female (82.6%), Anglophone (83.9%), and White (85.2%). The mean age of participants was 19.43 years ($SD = 1.67$). The self-injury subsample used in all analyses did not differ from the overall sample in terms of age, gender, or ethnicity but were more likely to be English speaking than French speaking, $\chi^2(1) = 7.49, p < .01$.

Measures

Ottawa Self-Injury Inventory (OSI; Cloutier & Nixon, 2003). The occurrence and frequency of NSSI were determined by responses to the question "How often in the past 6 months have you actually injured yourself without the intention to kill yourself?" (range from 0, *not at all*, to 4, *daily*). The functions of recent NSSI were assessed by having individuals indicate the degree to which 31 items (e.g., "to release unbearable tension," "to get care and attention from others") corresponded with their reasons for engaging in NSSI (range from 0, *never a reason*, to 4, *always a reason*). Seven items developed from the *DSM-IV-TR* criteria for

substance dependence and adapted to reflect the use of NSSI were used to assess addictive features (e.g., “Despite a desire to cut down or control this behavior, you are unable to do so”). Responses ranged from 0 (*never*) to 4 (*always*). The following questions were also used: (a) “Do you hurt yourself after stressful things happen?” (range from 0, *never*, to 4, *always*); (b) “Once you think about harming yourself, do you always do it?” (*yes/no*); and (c) “Do you feel relief after harming yourself?” (range from 0, *never*, to 4, *always*).

Functional Assessment of Self-Mutilation (FASM; Lloyd, Kelley, & Hope, 1997). The 21 functions items of the FASM (see Nock & Prinstein, 2004, for validity) were used in this study. Functions measured by the FASM include escape (e.g., using NSSI to avoid school, work, or other activities), tension reduction (e.g., using NSSI to relieve feeling numb or empty), external reinforcement (e.g., using NSSI to get attention), and self-stimulation (e.g., using NSSI to be like someone respected). Cronbach’s alphas for the current sample ranged from .71 to .91.

Outcome Questionnaire (OQ; Lambert et al., 1996). The OQ is a 45-item scale that assesses psychological well-being through measuring the degree to which individuals struggle with interpersonal relations, social roles, and symptomatic distress. Responses are rated on a 5-point scale ranging from *never* to *almost always*. Current Cronbach’s alphas ranged from .60 to .83.

Youth Stress and Coping Questionnaire (YSCQ; Cloutier, Kennedy, & Glennie, 2008). Only the final item of the YSCQ was used. Participants indicated all risky behaviors they had engaged in from a forced-choice list of 10 behaviors (stealing, reckless driving, physical risks, gambling, uncontrolled alcohol use, Internet porn, drug use, vandalism, risky sex, and other), which were then summed across all types to show the total number of risk behaviors in which the participant had engaged. In this sample, 65% of participants reported engaging in between zero and four risk behaviors.

Items, including age, language (French or English), and gender (male or female), used for discriminant evidence were taken from a sociodemographic questionnaire created for this project.

Results and Discussion

Sample Characteristics

The majority of participants (73.2%) had engaged in NSSI between one and five times in the past 6 months, while 12.8% reported monthly self-injury, 10.1% weekly self-injury, and 4.0% daily. The most commonly reported method was cutting (73.8%), followed by scratching (61.0%), interfering with wound healing (39.0%), and hitting (38.3%). Average age of onset for NSSI was 14.75 years ($SD = 2.77$).

Internal Structure and Validity of Function Scores

An exploratory factor analysis (EFA) using unweighted least squares and oblique rotation was conducted on the 31 items assessing the initial functions for NSSI. A four-factor solution was ultimately retained based on examination of eigenvalues and scree plot, with only factor loadings of .45 or higher retained (Comfrey & Lee, 1992). Six items (see Table 1) were dropped due to insufficient loadings and one additional item (“To help me escape

from uncomfortable feelings or moods”) was removed due to double loading on Factors 1 and 3. In total, the four factors accounted for 42.64% of the variance with a Kaiser–Meyer–Olkin (KMO) value of .77, indicating sampling adequacy; Table 1 lists the retained items and their factor loadings, as well as eigenvalues and Cronbach’s alphas for the factor scores. Each obtained factor corresponded with at least one of the superordinate functions described by Klonsky (2007). The first factor was labeled *internal emotion regulation (internal ER)* and was composed of items reflecting NSSI used to regulate emotions related to internalizing symptoms, such as sadness, numbness, or suicidal urges. This factor resembled a combination of Klonsky’s affect regulation, antidissociation, self-punishment, and antisuicide functions. The second factor, *social influence*, consisted of items indicating that NSSI was used to gain something from others, or to affect change in social contexts, similar to Klonsky’s interpersonal influence category. A third factor, *external ER* implicated NSSI used to manage emotions that may otherwise be expressed externally, such as frustration or anger, and most closely resembled Klonsky’s affect regulation function. Finally, the *sensation-seeking* factor was made up of items indicating NSSI as a means of achieving a feeling of exhilaration or excitement, strongly resembling Klonsky’s category of the same name. Thus, the four functions measured by the OSI largely cover the wide range of overarching functions described by past review.

Convergent evidence for the OSI’s function scores was established through correlations with scores on the previously validated functions subscales of the FASM. Both the FASM’s escape (e.g., “To avoid being with people”) and external reinforcement (e.g., “To get attention”) functions were positively related to the OSI’s social influence scores (r s: .41 and .63, p s < .05 and .001, respectively), as would be expected, given that both FASM functions represent means of changing one’s social circumstances. Similarly, the FASM’s tension reduction dimension (e.g., “To stop bad feelings”) was related to the OSI’s internal ER scores ($r = .35$, $p < .05$), each of which addresses feeling production and management of depressed emotions. Additionally, no significant correlations were found between external ER scores and any of the FASM’s functions (r s: from $-.31$ to $.31$, p s: from .08 to .39), likely because none of the FASM functions closely resembled the construct underlying the OSI’s external ER function, given its uniqueness in assessing aggressive emotions. This result further suggests a clear distinction between the types of emotions regulated in the OSI’s two emotion-regulation factors. Interestingly, the FASM’s tension-reduction function was correlated with scores on the OSI’s sensation-seeking factor ($r = .36$, $p < .05$), which may be more intuitive when considered at the item level. Tension reduction on the FASM is in part characterized by items reflecting the creation of feelings (e.g., “To relieve feeling numb or empty”), which would ordinarily be associated with an antidissociation function. However, it is possible that the feelings generated may feel similar to exhilaration or excitement, as measured by the OSI’s sensation-seeking factor. Indeed, the current findings suggest an association between sensation seeking and at least some aspects of feeling generation, and additional research would help to further elucidate these implications.

Next, convergent evidence for the function factor scores was analyzed through correlations with indicators of psychological well-being. Social influence scores were linked with issues in

Table 1
Factor Loadings, Eigenvalues, and Descriptive Statistics for the Function Factors of the Nonsuicidal Self-Injury Inventory

Motivation	Internal emotion regulation	Social influence	External emotion regulation	Sensation seeking
To stop me from thinking about ideas of killing myself	.81	.31	.19	.15
To stop me from acting out ideas of killing myself	.80	.31	.16	.10
To relieve feelings of sadness or feeling "down"	.67	.15	.41	.12
To produce a sense of being real when I feel numb and "unreal"	.63	-.03	.28	.42
To stop feeling alone and empty	.61	.13	.20	.18
To distract me from unpleasant memories	.59	.14	.21	.21
To experience physical pain in one area, when the other pain I feel is unbearable	.58	-.05	.40	.29
To punish myself	.47	.17	.26	.25
To get out of doing something that I don't want to do	.12	.59	-.16	.21
To belong to a group	.08	.55	-.12	.33
To diminish feelings of sexual arousal	.05	.54	-.19	.42
To get care and attention from other people	.16	.52	.13	.33
To avoid getting in trouble for something I did	.15	.51	.10	.13
To stop my parents from being angry at me	.16	.50	.15	.09
To show others how hurt or damaged I am	.05	.48	.10	.43
To stop people from expecting so much from me	.37	.48	.05	.23
To change my body image and/or appearance	.32	.46	.10	.28
To release frustration	.29	.07	.94	.14
To release anger	.26	.14	.79	.11
To release unbearable tension.	.38	-.12	.57	-.04
To provide a sense of excitement that feels exhilarating	.24	.29	.10	.76
To experience a "high" like a drug high	.37	.19	.18	.54
To prove to myself how much I can take	.29	.27	.19	.51
For sexual excitement	.00	.23	-.12	.50
Eigenvalues	5.75	3.10	1.79	1.63
Variance (%)	21.76	10.53	5.98	4.38
α	.85	.75	.80	.67
Mean scores	13.34	4.49	7.37	2.30

Note. Bolded values indicate retained factor loadings (>.45) for each obtained factor. The following six items were omitted due to insufficient factor loadings (<.45): (a) For no reason that I know about, it just happens sometimes; (b) To stop my friends/boyfriend/girlfriend from being angry with me; (c) To relieve nervousness/fearfulness; (d) To satisfy voices inside or outside me telling me to do it; (e) To have control in a situation where no one can influence me; (f) To show others how strong or tough I am.

interpersonal relationships ($r = .19, p < .05$), while no other significant correlations were found (r s: .13–.16, ps : .09–.18). This finding is logical, as individuals using NSSI to influence others would likely report disruptions within interpersonal relationships. Scores on internal ER, social influence, and external ER were all positively related to problems in social roles (r s: .20–.22, $ps < .05$), while sensation-seeking scores were not ($r = .10, p = .27$). Again this finding is intuitive, such that, regarding social influence scores, NSSI may be used as a means of exerting influence over others, or as a way of avoiding responsibilities, thus potentially causing performance difficulties in social roles within relevant contexts. Further, given that individuals using NSSI to regulate their emotions may be especially likely to experience mental health symptoms such as depression or anxiety (e.g., Brown, Comtois, & Linehan, 2002) and that poor mental health has been linked with difficulties performing in work or school contexts (e.g., Kessler, Foster, Saunders, & Stang, 1995), it is not surprising that individuals using NSSI to regulate either internalizing or externalizing emotions reported having problems within social roles. In contrast, the lack of association between social role problems and the sensation-seeking function may simply suggest that individuals endorsing this function do not experience the same social detriments as do individuals who use NSSI to regulate their emotions. However, this explanation is tentative and more research

is warranted. Finally, scores on all four factors were correlated to greater severity of symptom distress (r s: .18–.34, $p < .05$), but internal ER and external ER each accounted for more variance in symptom severity (R^2 s: .11 and .12) than either social influence or sensation seeking (R^2 s: .03 and .04). These findings are again in line with past research (e.g., Brown et al., 2002), suggesting that individuals who engage in NSSI to regulate emotion may be especially likely to also experience poor mental health.

Evidence for convergent validity of the function factors' scores was also demonstrated through correlations to risky behaviors, the context in which NSSI occurred, and the frequency of NSSI behaviors. A greater number of risky behaviors were correlated to high scores on the sensation-seeking function ($r = .17, p < .05$), but not to scores on any other functions (r s: from -.03 to .04, ps : from .60 to .91). These findings are in line with past research linking sensation-seeking functions with risky behaviors such as drug use (Osuch, Noll, & Putnam, 1999). Regarding context of NSSI (e.g., "Do you hurt yourself after stressful things happen?"), significant correlations were found with scores on both internal and external ER functions (r s: .34–.47, $ps < .001$), but not for social influence or sensation-seeking scores (r s: .11–.13, ps : .12–.20). These results are sound, as the theory underlying ER functions of NSSI posits that the injury is used to decrease negative affect, such as feeling stress (Klonsky, 2007). In contrast, individ-

uals using NSSI for social influence or sensation-seeking reasons may not necessarily engage in NSSI following a stressful experience but are instead triggered by other contexts such as interpersonal interactions or boredom, respectively. Finally, with respect to NSSI frequency, more frequent NSSI was related to higher scores on both internal ER and sensation-seeking (r_s : .29 and .18, $p_s < .001$ and .05) functions. Frequency of NSSI was not significantly correlated with either social influence or external ER factors (r_s : .08–.13, p_s : .10–.33), suggesting that contrary to current theory and research (see Victor et al., 2012), frequent NSSI may be both negatively (internal ER) and positively (sensation-seeking) reinforcing. Future research regarding this notion is urged before making more substantiated conclusions. Finally, analyses examining discriminant evidence of function scores showed no significant correlations between the four functions factors and age, language, or gender (r_s : from $-.16$ to $.12$, p_s : from .05 to .96).

Internal Structure and Validity of Addictive Features Scores

The same EFA analytic strategy as described previously for the functions items was conducted on the seven addictive features items on the OSI. A single factor explaining 57.42% of variance with an eigenvalue of 4.02 and a KMO of .85 was identified; factor loadings ranged between .57 and .81. Cronbach's alpha for the addictive features scale was .87 with a mean score of 8.05.

Evidence for convergent validity of addictive features scores was established through correlations with the reported frequency of NSSI actions in the past 6 months, the degree to which respondents indicated feeling relief following NSSI behavior, and the functions factors of the OSI. Higher addictive features scores were related to more frequent NSSI ($r = .35$, $p < .001$), suggesting either that addictive features may develop with repeated engagement in the behavior or that individuals who deem their NSSI to have addictive features feel a corresponding need to engage in NSSI more frequently. Greater addictive features were also associated with feelings of relief following NSSI action ($r = .39$, $p < .001$), which may be likened to the, albeit temporary, relief experienced by addicts following use of their addicted substance (e.g., Koob et al., 2004). Next, participants who indicated always harming themselves after thinking about it reported higher scores on the addictive features scale ($M = 1.83$, $SD = 0.63$) than those who did not ($M = 1.11$, $SD = 0.97$), $t(146) = -2.19$, $p < .05$, which resembles symptoms related to substance abuse disorders, such as an inability to resist use of the substance (American Psychiatric Association, 2000). Last, correlations between the addictive features factor and each of the obtained functions factors of the OSI showed that addictive features were significantly positively correlated with scores on all four of the functions factors (r_s : .21–.50, $p_s < .05$), such that individuals who perceived addictive features of their NSSI behavior reported a variety of underlying functions, some of which negatively reinforce the behavior and some of which are positively reinforcing, again contrasting the findings of previous research (see Victor et al., 2012). Finally, as expected, discriminant evidence for addictive features scores was shown through the lack of significant correlation with age, language, or gender (r_s : from $-.16$ to $-.14$, p_s : from .05 to .14).

Despite the important findings of the current study, it is not without limitations. First, the relatively small sample size ($n =$

149) limits the generalizability of the obtained factors. Thus, future research should replicate the current results using larger samples. Second, data were collected using electronic self-report measures, limiting the researchers' ability to control the testing environment for all participants. The self-report nature of these questionnaires may have also been an issue, particularly since all validity analyses were conducted between self-reported data. As such, additional research should be conducted to validate the function and addictive features scales with a variety of methodologies. Third, a number of items originally included on the OSI's function scale were excluded through the EFA. The original items were selected based solely on information regarding self-injuring youth (ages 12–17) in clinical contexts. It is possible that not all of the functions identified to be important for clinical youth and thus included on the OSI would be equally relevant to the current university student sample, potentially explaining their removal during the EFA.

The current study provides preliminary support for the psychometric properties of the OSI's functions and addictive features scales in a university student sample. Convergent evidence was found for scores on both functions and addictive features on the OSI through correlations (or lack thereof) with theoretically and empirically logical concepts. Moreover, convergent evidence was also shown for the obtained function factors' scores through associations with an established measure of NSSI function. Together these findings suggest that the OSI is an appropriate measure for comprehensively assessing both functions and potential addictive features of NSSI, which may be of particular interest clinically for tailoring treatment plans. The OSI provides a substantial addition to both the sparse literature concerning NSSI's addictive features and to the literature regarding NSSI assessment, as no other tool is capable of simultaneously assessing both characteristics. Although additional research with larger samples is required to further substantiate the current psychometric findings, as is more research in general regarding NSSI's potential addictive properties, across both clinical and normative samples, the current findings demonstrate the OSI's promise as a useful assessment tool.

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