Original Article

*Artigo Original*

# Singing voice handicap mapped by different self-assessment instruments

## *Desvantagem vocal no canto mapeado por diferentes protocolos de autoavaliação*

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**Keywords**

Voice
Quality of life
Self-assessment
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## ABSTRACT

**Purpose:** To map voice handicap of popular singers with a general voice and two singing voice self-assessment questionnaires. **Methods:** Fifty singers, 25 male and 25 female, 23 with vocal complaint and 27 without vocal complaint answered randomly the questionnaires. For the comparison of data, the following statistical tests were performed: Mann-Whitney, Friedman, Wilcoxon, Spearman and Correlation. **Results:** Data showed that the VHI yielded a smaller handicap when compared to the other two questionnaires (VHI x S-VHI – p=0.001; VHI x MSVH – p=0.004). The S-VHI and MSVH produced similar results (p=0.723). Singers with vocal complaint had a VHI total score of 17.5. The other two instruments showed more deviated scores (S-VHI – 24.9; MSVH – 25.2). There was no relationship between gender and singing style with the handicap perceived. A weak negative correlation between the perceived handicap and the time of singing experience was found (-37.7 to -13.10%), that is, the smaller the time of singing experience, the greater the handicap is. **Conclusion:** The questionnaires developed for the assessment of singing voice, S-VHI and MSVH, showed to be more specific and correspondent to each other for the evaluation of vocal handicap in singers. Findings showed that the more the time of singer's singing experience, the smaller the handicap is. Gender and singing styles did not influence the perception of the handicap.

**Descritores**

Voz
Qualidade de vida
Autoavaliação
Estudos de avaliação
Qualidade da voz
Música

## RESUMO

**Objetivo:** Mapear desvantagens vocais em cantores populares por meio de protocolos de autoavaliação: um genérico (IDV) e outros dois específicos para canto (IDV-C e IDCM). **Métodos:** Cinquenta cantores, 25 de cada gênero, 23 com queixa vocal e 27 sem queixa vocal responderam aos 3 protocolos, apresentados em ordem casual. Para a comparação dos resultados, foram utilizados os testes estatísticos: Mann-Whitney, Friedman, Wilcoxon, Spearman e Correlação. **Resultados:** Os resultados mostraram que o protocolo IDV aponta menor desvantagem que os protocolos específicos (IDV x IDV-C – p= 0,001; IDV x IDCM – p=0,004). O IDCM e IDV-C foram correspondentes e intercambiáveis em sua comparação (p=0,723). Os cantores com queixa apresentaram um escore total para o IDV de 17,5. Os outros protocolos apresentaram valores mais desviados IDV-C – 24,9 e IDCM – 25,2. Não foi verificada influência do gênero e de estilo de canto na percepção da desvantagem vocal em nenhum dos protocolos. Uma fraca correlação entre a desvantagem percebida e o tempo de canto foi encontrada (-37,7 para -13,10%), sendo que quanto menor a prática no canto, maior a desvantagem referida. **Conclusão:** O IDCM e o IDV-C mostraram-se mais específicos e são similares na avaliação de cantores. Quanto maior o tempo de experiência do cantor, menor é sua desvantagem. O gênero e o número de estilos de canto não influenciaram a percepção da desvantagem vocal.

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## INTRODUCTION

According to the World Health Organization (WHO), health is the state of complete physical, mental, and social well-being. This definition has been constantly extended, including important considerations about quality of life. Quality of life is the perception a person has of his/her position in life, based on socioeconomic and cultural contexts; the value system in which he/she lives; and the objectives, expectations, standards, and interests in his/her life[1].

Several studies in the past have attempted to measure the quality of life of their subjects who had disorders and/or diseases. As a separate discipline, speech therapy has also focused on quality of life because objective evaluation, which provides important data about the pathological process, does not report patient's point of view about his/her problem and his/her professional and social perspectives[2,3].

As would happen with research pursuits that attempt to evaluate a person's general health status, the voice health assessment, too, must analyze the perspective that a patient has concerning his/her quality of life, by measuring the extent of changes that have taken place in his/her quality of life on account of problems related to impairment in voice health[4,5]. Thus, it is possible to learn the functional, social, and emotional consequences for a person's professional and financial performances in light of his/her voice alteration[4].

Since the 1990s[6], several instruments that were used to evaluate a person's voice perception became more refined and carefully developed to include advanced test processes and validation methods, including tools such as self-assessment psychometric measures.

Following these, to better understand the perception that a patient has of his/her voice, general protocols were developed, such as the Voice Handicap Index (VHI)[7], an instrument that assesses the handicap caused by problems in spoken voice[7-11]; the Voice-Related Quality of Life (V-RQOL) questionnaire[4], a tool that measures the impact of a voice issue on the quality of life; and the Voice Activity and Participation Profile (VAPP)[12], a type of dysphonia perception assessment that focuses on the limitation of activities and restriction of participation. These three protocols have already been validated for use in Brazilian Portuguese language[13].

In order for self-assessment protocols to be regarded as more efficient instruments, they must be designed for assessing specific diseases, populations, occupations, and so on. Therefore, in the voice area, after the VHI protocol implementation, which is current the most internationally diffused self-assessment instrument[7,8], investigators are concerned about developing protocols specific to certain groups of people, for example, singers. Singers seem to be more susceptible to factors that adversely affect their voice, like, for example, gastroesophageal reflux and allergies. Such disorders, coupled with higher voice demand and/or use of inappropriate singing techniques, result in voice fatigue causing dysphonia; even though this order hardly poses any risk to life, it can still compromise his/her singing performance[14]. Hence specific protocols were developed to assess singers' quality of life, such as the Singing Voice Handicap Index (S-VHI)[14], the S-VHI 10[15], Adaptation of the S-VHI[16], Modern Singing Handicap Index (MSHI), and Classical Singing Handicap Index (CSHI)[17]. The MSHI and CSHI are two versions of the same instrument that focus on specific aspects of modern and classical singing in Brazilian Portuguese language[18,19]. It is not known whether these protocols are interchangeable, complementary, or reflect several perspectives of the same problem. Therefore, the present study aimed to carry out a comparative analysis between VHI-30, which assesses the general impact of a dysphonia, and two specific protocols for singing (S-VHI and MSHI), by identifying the similarities and differences in a group of popular singers with and without vocal complaint. It had also investigated the influence of gender on patient's perception about the voice handicap and whether singing style influenced an individual's perception on his/her voice handicap and the length of time the patient had experienced the handicap.

## METHODS

The study was approved by the Research Ethics Committee of the Institution (REC 1316/08), and all the participants signed the Informed Consent granting their permission to participating and disclosure of this research and its results.

Fifty professional and nonprofessional singers took part in this work, which included 25 male and 25 female; out of these, 23 were with vocal complaints and 27 were without it; study volunteers included professional and nonprofessional singers, students, and teachers. Subjects were assigned to these two groups on the basis of the number of symptoms reported in the questionnaire of signs and symptoms developed by Roy et al.[20]. People with three or more voice symptoms were considered as having vocal complaints[21]. They were aged between 16 and 74 years and were on average 34.8 years old; the sample included 27 singing students, 12 nonprofessional singers, 11 professional singers, and 7 were singing teachers as well. The mean singing period of the sample subjects was 13 years, ranging from a period as short as 1 year to a maximum 55 of years. Concerning types of singing, it was found a variety of styles were used by the study subjects (some of them had experience singing in up to 5 different styles); 27 of them sang in chorus, 26 were classical singers, 18 were popular singers, 13 were gospel singers, 6 were rock singers, 5 followed other styles, 4 were country singers, and 3 were *samba/pagode* singers. Another finding concerning source of income for these subjects is that for 24 subjects singing was their primary source of income (17 primary and 7 secondary) and 26 of them had incomes from other activities. The following voice symptoms were identified: phlegm (24), dry throat (21), hoarseness and sore throat (17), difficulty with singing in high pitches (11), discomfort in speaking, voice "gets tired or changes after using it in a short period" and acid and bitter taste in the mouth (8), difficulty in projecting the voice (7), voice instability or shivering (6), problems with singing or talking softly or requiring greater effort to speak (4), and flat voice and difficulty to swallow (2).

Singers answered questions posed to them from three protocols (VHI-30, S-VHI, and MSHI); the protocols were administered without the investigator's support, with questions posed in a random order and without consulting previously answered questionnaires.

VHI-30 is a protocol directed to assess voice handicap in a dysphonic patient and included 30 items and 3 domains: emotional, functional, and organic. Each item is answered using a 5-point Likert-type scale: 0=never, 1=hardly ever, 2=sometimes, 3=almost always, and 4=always. The total score varied from 0 to 120 points, with 0 indicating no handicap and 120 indicating maximum handicap due to a voice problem. The domain scores varied from 0 to 40.

S-VHI includes 36 items developed to measure handicap caused by damage to singing voice; the question were answered using five-point Likert-type scale: 0=never, 1=hardly ever, 2=sometimes, 3=almost always, and 4=always. The total score varied from 0 to 144 points, and the higher the value, the higher the voice handicap. This protocol does not present domains or subscales.

MSHI is also a protocol developed to measure singing-voice handicap and includes 30 items, which were divided into 3 subscales: inability, handicap, and flaw, which correspond to functional, emotional, and organic domains, respectively[18]. Each subscale is composed of 10 items and were answered similar to that demonstrated in the other protocols. Items in this instrument were also answered in a 5-point Likert-type scale: 0=never, 1=hardly ever, 2=sometimes, 3=almost always, and 4=always. The MSHI score calculation is carried out similar to that of VHI-30 and S-VHI, and the total score varied from 0 to 120 points, and the subscales from 0 to 40 points.

Scores from the three protocols were changed to percentage values in order to facilitate a comparison between different final results; thus, the values presented correspond to the handicap percentage but not to the gross values obtained.

Results were submitted to statistical treatment with a 0.05 significance level (5%), and the confidence intervals were developed with 95% statistical confidence. For the analysis of nonparametric variables, Mann-Whitney's *U* test was used to compare the results between genders in all domains and the results of all protocols between the complaint group and the control group. Friedman's test was used to compare between the total scores of the three protocols. Wilcoxon's test was used to carrying out paired comparisons between the total scores. Spearman's test was used to measure the degree of relationship between musical styles and results of protocols, and the correlation test was used to confirm the values of correlations obtained by Spearman's test. Spearman's correlation was used to the study the correlation between the scores measured by using VHI-30, MSHI, and S-VHI protocols that assessed musical style and perceived handicap. A correlation matrix was developed and used for identifying correlation signals (positive or negative), that is, voice handicap determination and quality, in addition to the Kappa concordance index, which measures the degree of concordance between two qualitative variables (quality <20%=unimportant, 21% to 40%=minimum; 41% to 60%=regular, 61% to 80% = good, and above 81% = great)[22].

## RESULTS

Table 1 presents total and partial scores of the three analyzed protocols in percentages. Total scores of MSHI and S-VHI presented similar statistical values (p=0.723), but they were statistically different from VHI (p=0.001).

**Table 1.** Mean scores of the domains from the Handicap Voice Index, Modern Singing Handicap Index, and Singing Voice Handicap Index protocols of the whole sample

| Protocols | Mean | Standard deviation |
|---|---|---|
| VHI-30 | | |
| Total | 11.4 | 12.5 |
| Emotional | 8.1 | 15.3 |
| Functional | 10.9 | 11.8 |
| Organic | 15.2 | 15.0 |
| MSHI | | |
| Total | 15.8 | 17.6 |
| Inability | 5.4 | 7.7 |
| Handicap | 5.3 | 7.1 |
| Flaw | 8.3 | 7.9 |
| S-VHI | 16.6 | 17.0 |

Friedman's test: VHI-30xMSHIxS-VHI – p-value of the total score = 0.001; Wilcoxon's test: VHI-30xMSHI – p=0.004; VHI-30xS-VHI – p=0.001; S-VHIxMSHI=0.723
**Caption:** VHI-30 = Handicap Voice Index; MSHI = Modern Singing Handicap Index; S-VHI = Singing Voice

Table 2 presents a comparison of total and partial scores of the three protocols between groups with and without voice complaint. All scores from the three protocols were different when both groups were compared, with the exception of VHI functional score (p=0.054). Furthermore, the vocal complaint group scored higher than the control group.

Table 3 shows means and standard deviations found in partial and total scores of protocols in relation to gender.

Table 4 presents correlations between scores of protocols and singing experience time. It was verified that correlation of singing experience time was negative in all scores of across the protocols (varying from -37.70 to -13.10%). In other domains, correlations were positive. Correlation was high between VHI-30 total score and VHI-30 (emotional, physical, and organic scores), between total MSHI and MSHI (inability, handicap, and flaw), and between S-VHI and MSHI (flaw and total). Correlation was good between VHI-30 total score and MSHI (inability, handicap, flaw, and total) and S-VHI and between VHI-30 emotional score and VHI-30 (physical and organic scores) and total MSHI. Correlation was regular between VHI-30 emotional score and MSHI (inability, handicap, and flaw) and S-VHI and between VHI-30 functional score and MSHI (inability and handicap) and S-VHI. The analysis was done based on Kappa's concordance index[22].

Table 5 presents values of associations between scores and quantity of styles experienced. Correlations found in this analysis were classified as unimportant because all values were lower than 20%, according to Kappa's concordance index[22].

**Table 2.** Mean scores of the domains of the Handicap Voice Index, Modern Singing Voice Handicap Index, and Singing Voice Handicap Index for the groups with and without vocal complaint

| Protocols | With complaint | | Without complaint | | p-value* |
|---|---|---|---|---|---|
| | Mean | Standard deviation | Mean | Standard deviation | |
| VHI-30 | | | | | |
| Total | 17.5 | 15.0 | 6.2 | 6.4 | 0.001 |
| Emotional | 15.0 | 20.1 | 2.2 | 4.6 | <0.001 |
| Functional | 14.1 | 13.1 | 8.1 | 10.0 | 0.054 |
| Organic | 23.4 | 17.3 | 8.2 | 7.7 | <0.001 |
| MSHI | | | | | |
| Total | 25.2 | 21.3 | 7.7 | 7.6 | 0.001 |
| Inability | 9.5 | 9.6 | 1.9 | 2.2 | 0.004 |
| Handicap | 8.5 | 8.8 | 2.5 | 3.5 | 0.004 |
| Flaw | 12.2 | 9.0 | 5.0 | 4.8 | 0.004 |
| S-VHI | 24.9 | 21.2 | 9.5 | 7.3 | 0.012 |

Mann-Whitney's Test

**Caption:** VHI-30 = Handicap Voice Index; MSHI = Modern Singing Handicap Index; S-VHI = Singing Voice

**Table 3.** Mean scores of the Voice Handicap Index, Modern Singing Handicap Index, and Singing Voice Handicap Index protocols according to gender

| Protocols | Female | | Male | | p-value* |
|---|---|---|---|---|---|
| | Mean | Standard deviation | Mean | Standard deviation | |
| VHI-30 | | | | | |
| Total | 12.8 | 15.7 | 10.0 | 8.2 | 0.823 |
| Emotional | 11.6 | 20.3 | 4.6 | 6.3 | 0.401 |
| Functional | 11.5 | 14.2 | 10.2 | 9.0 | 0.769 |
| Organic | 15.2 | 16.7 | 15.2 | 13.4 | 0.689 |
| MSHI | | | | | |
| Total | 16.9 | 21.2 | 14.6 | 13.5 | 0.801 |
| Inability | 5.5 | 9.1 | 5.3 | 6.1 | 0.319 |
| Handicap | 6.3 | 9.1 | 4.2 | 4.2 | 0.791 |
| Flaw | 8.5 | 8.6 | 8.1 | 7.2 | 0.953 |
| S-VHI | 18.3 | 20.1 | 14.9 | 13.4 | 0.915 |

Mann-Whitney's Test

**Caption:** VHI-30 = Handicap Voice Index; MSHI = Modern Singing Handicap Index; S-VHI = Singing Voice

**Table 4.** Valores da correlação entre escores dos protocolos Índice de Desvantagem Vocal, Índice de Desvantagem Canto Moderno e Índice de Desvantagem Vocal para o Canto e Tempo de canto

| Protocols | | Singing experience time | VHI-30 (total score) | VHI-30 (emotional score) | VHI-30 (functional score) | VHI-30 (organic score) | MSHI (inability) | MSHI (handicap) | MSHI (flaw) | MSHI (Total) |
|---|---|---|---|---|---|---|---|---|---|---|
| VHI-30 Total | Corr | -25.90% | | | | | | | | |
| | p-value | 0.069# | | | | | | | | |
| Emotional | Corr | -13.10% | 85.40% | | | | | | | |
| | p-value | 0.363 | <0.001* | | | | | | | |
| Physical | Corr | -37.10% | 83.80% | 64.20% | | | | | | |
| | p-value | 0.008* | <0.001* | <0.001* | | | | | | |
| Organic | Corr | -30.00% | 92.50% | 73.10% | 68.20% | | | | | |
| | | 0.034* | <0.001* | <0.001* | <0.001* | | | | | |
| MSHI Inability | Corr | -20.50% | 73.60% | 59.50% | 58.80% | 74.70% | | | | |
| | p-value | 0.153 | <0.001* | <0.001* | <0.001* | <0.001* | | | | |
| Handicap | Corr | -37.60% | 64.50% | 57.90% | 48.70% | 63.50% | 65.80% | | | |
| | p-value | 0.007* | <0.001* | <0.001* | <0.001* | <0.001* | <0.001* | | | |
| Flaw | Corr | -26.40% | 74.90% | 57.90% | 61.00% | 78.40% | 79.30% | 71.90% | | |
| | | 0.064# | <0.001* | <0.001* | <0.001* | <0.001* | <0.001* | <0.001* | | |
| Total | Corr | -33.40% | 78.10% | 64.80% | 63.10% | 79.60% | 86.00% | 85.80% | 94.50% | |
| | p-value | 0.018* | <0.001* | <0.001* | <0.001* | <0.001* | <0.001* | <0.001* | <0.001* | |
| S-VHI | Corr | -37.70% | 69.50% | 53.70% | 51.10% | 78.00% | 71.20% | 70.50% | 80.10% | 81.10% |
| | p-value | 0.007* | <0.001* | <0.001* | <0.001* | <0.001* | <0.001* | <0.001* | <0.001* | <0.001* |

*p-values considered statistically significant for the adopted significance level; #p-values that tend to be significant because they are close to the acceptance limit

**Caption:** Corr = correlation; VHI-30 = Handicap Voice Index; MSHI = Modern Singing Handicap Index; S-VHI = Singing Voice Handicap Index

**Table 5.** Correlation values between scores of the protocols Voice Handicap Index, Modern Singing Handicap Index, and Singing Voice Handicap Index and quantity of styles practiced

| Protocols | Style | |
|---|---|---|
| | Correlation (%) | p-value* |
| VHI-30 | | |
| Total | 7.00 | 0.628 |
| Emotional | 0.20 | 0.987 |
| Functional | -0.70 | 0.963 |
| Organic | 5.80 | 0.692 |
| MSHI | | |
| Total | -3.30 | 0.819 |
| Inability | -1.90 | 0.895 |
| Handicap | -8.40 | 0.562 |
| Flaw | 1.20 | 0.933 |
| S-VHI | -1.10 | 0.938 |

Spearman'sTest

**Caption:** VHI-30 = Handicap Voice Index; MSHI = Modern Singing Handicap Index; S-VHI = Singing Voice

## DISCUSSION

A singer is a voice professional who belongs to a group exposed to the risk of developing voice problems; therefore, his/her voice health requires more care[14,15].

Recently, it has come to light that voice disorders in this population result in changes, adaptations, and/or interruptions in their daily as well as professional life. In addition, lifestyle, social environment, and the place where voice is professionally used can contribute to the emergence or persistence of vocal disorders[23,24].

Measuring how such changes and adaptations affect a patient's life facilitates the evaluation and management of these professional singers[14] because the degree of limitation in a subject's quality of life does not necessarily point to degree of severity of dysphonia[25]. Hence, use of quality-of-life protocols in dysphonic patients is important[26], specially in singers, because it could provide an appropriate orientation in therapeutic management and voice use during treatment.

Thus, in order to optimize singers' evaluation process, we comparatively analyzed the VHI-30 protocol, which is the most widely used questionnaire in the world, and two specific proposals for singing, the S-VHI and MSHI, for identifying similarities and differences.

It was seen that VHI-30 under-evaluated the sample, which is expected since it is a generic protocol. As for MSHI, in comparing the three subscales, the flaw subscale, which is the organic domain, presented the highest scores, followed by inability and handicap subscales that represent the functional and emotional domains, respectively. Since the majority in the study group were nonprofessional singing students, for whom singing is not the primary source of income, their perception on restriction or a decrease in their ability to sing did not point to a severe handicap vis-à-vis the scores obtained through this protocol. In S-VHI, however, the average score of the assessed group of singers indicated a discrete, perceived handicap. Since there were no studies specific to the Brazilian context that managed these protocols, we do not have values for comparison (Table 1).

It is seen that the highest scores of VHI-30 happened in the organic and emotional domains ($p<0.001$), a finding similar to the those reported in other literature studies[8,13], which were carried out for dysphonic individuals who were not singers. Singers with complaint had higher scores than dysphonic people, probably because of the attention given to the vocal instrument, with more demands placed on their quality. In MSHI, the group of singers with complaint scored higher in the flaw subscale, followed by inability. A study with nonprofessional singers[18] also found similar results. The word *flaw* is defined as any psychological, physiological, anatomic, structural, temporary, or permanent loss or abnormality. Inability means any restriction or decrease in the ability to perform an activity that is usually expected of a subject. Otherwise, handicap is a result of a flaw or inability, characterized by limitations or restraints in accomplishing a role expected of a person, which in turn has social, cultural, development, and economic consequences[27,28]. Thus, singers notice there is something wrong with their voice production and perceive this to be a limitation or disadvantage. As previously mentioned, majority of the study sample included both singing students and nonprofessional singers; therefore, the perception of a voice handicap in their lives can have a lower value than would be the case with the population of professional singers. Although S-VHI results were statistically different from groups with and without vocal complaint, as shown in literature findings[14,28], scores were lower than those observed by Cohen et al.[14]. Furthermore, all mean scores of the group without complaint were lower than the other group (Table 2).

As for gender, it was observed that even though women in the speech therapy clinic asked for help due to dysphonia[29], in the present study it was found that the impact of a possible voice problem was perceived by both genders on a similar level. This was reported in other studies as well[18,30], which noticed the self-reported impact of voice alteration on the quality of life varied according to gender, age, and professional singing (Table 3).

It has been noticed that correlations between voice handicap and singing experience time indicated a negative association in all protocols, evidencing that there is higher disadvantage if the singing voice was developed within a shorter period. This is understandable, since singing classes provide training for muscle adjustments that differ substantially with spoken voice, leading to discomfort and voice problems in the early learning stages[22]. Although the said finding relates to a negative correlation, its strength is low, and therefore, deviations in the protocol of singers who are at an early stage of practice must be carefully assessed. Other correlations between protocols were all positive and statistically significant, indicating association between the various scores of protocols, although at different levels of strength. For example, correlation between S-VHI and VHI-30 and MSHI total score is strong and higher than that observed between S-VHI and VHI-30, which is only moderate. Thus, both specific singing protocols have higher correspondence between

them than with the generic protocol used for assessing dysphonia since subjects demonstrated lower sensibility in identifying the specific questions to singing voice when subjected to questions posed through this protocol[15,18,19] (Table 4).

There is a correlation between music style and VHI-30, MSHI, and S-VHI protocols. Results show correlations with values lower than 9%, and the specific singing protocols presented a negative association. Thus, there was no significant relationship between the variables; therefore, singing more than one musical style does not increase voice handicap perception (Table 5).

This study was carried out with popular professional and nonprofessional singers and corroborates the fact that in voice evaluation one should take into the consideration patients' self-assessment. However, in order to optimize the process, it is necessary to use a specific protocol for this group, and the evaluator must choose between S-VHI and MSHI because both are interchangeable.

## CONCLUSION

Based on a comparative analysis between different self-assessment protocols used for assessing the impact of an alteration in singing voice in both singers with and without vocal complaint, it was concluded that VHI-30 is a generic instrument and cannot fully assess the impact of a voice problem. The MSHI and S-VHI better explore this difficulty and are interchangeable. Furthermore, gender and singing in more number of styles did not influence the voice-handicap perception, indicating that the longer a singer's experience time, the lower is his/her voice handicap.

**KP was in charge of data collection, tabulation and analysis, and writing of the manuscript; GO and MB were in charge of the study outlining, general guidance about the phases of manuscript development and elaboration.*

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