

Prevalence, Progress and Severity of Periodontal Disease among Belgian young Military

Prévalence, évolution et gravité de la maladie parodontale chez les jeunes militaires belges

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Abstract

Purpose

Research on periodontal disease and its predictors on young Military personnel is sparse. This study aimed to determine the periodontal disease and assess the relationship with associated factors in soldiers between 19 and 35 years.

Patients and Methods

A cross-sectional observational study was conducted from June 1, 2023 until December 15, 2023 in Belgium. 107 participants from the Belgian ISTAR battalion were analysed of their periodontal condition during the dental annual check-up according STANAG 2466 to make military personnel dentally fit.

Before the periodontal examination, a panoramic x-ray was taken and participants filled in a self-administered questionnaire that included several epidemiological variables such as age, gender, educational level, number of fillings or caries and systematic diseases e.g. diagnosis of diabetics.

One examiner evaluated the periodontal status of the participants with an automatic electronic 3rd generation periodontal probe Pa-on.

Results

The mean age of the participants was 25.98 years. The average probing depth was 2.52 mm, the overall plaque index was 32.37 % and bleeding on probing was 17.62 %. 38.32 % of the subjects had no pathological pockets. 6.54 % showed moderate periodontitis and 55.14 % of the subjects had mild periodontitis. No pockets larger than 6 mm were found.

There was not a significant correlation between ageing and bleeding on probing and ageing and plaque index. There was a significant increase of plaque with the condition of the periodontium. Healthy and moderate periodontium persons have significant relative less bleeding on probing and decayed or filled teeth than others.

Bleeding on probing between the two age groups (19-23-years and 31-35-years) decreases with soldiers' age. Plaque between both groups remains at a high level and increases. There is no improvement in dental hygiene ratios. In the meantime, we saw a significant increase of more than 75 % in the number of decayed or filled teeth. There was a mean increase of pocket depth by 11 % from the age 19-23 to the age of 31-35. Healthy and moderate periodontitis participants have 2.5 times fewer fillings or decayed teeth than military with gingivitis and mild periodontitis.

Conclusion

Our research revealed that young Belgian military adolescents don't have optimal oral hygiene habits. This, in turn, means that efforts to promote preventative dental care should be reiterated in the present and future young adolescent population. Survey results and accurate health statistics serve as base findings for the military agreements to make choices how to improve the military agreements.

The study also shows that the risk factor such as bleeding on probing (BoP) play a minor role for the periodontal condition up to 35 years, in contrast to plaque, which increases in soldiers with deep pockets. Measured by the poor dental hygiene of the young recruits and older soldiers, the mean of plaque index changes negative and is at a high level. The number of fillings increases by more than 75 percent and the mean pocket depth increase 11 percent. It is therefore important to provide information and instructions about dental hygiene to soldiers, even if they show any minor forms of periodontal destruction at this young age.

Keywords : Epidemiological surveys, periodontal status, prevalence, Bleeding on Probing, Plaque Index, Belgian military, risk outcomes for periodontitis.

Résumé

But

Les recherches sur les maladies parodontales et leurs prédicteurs chez les jeunes militaires sont rares. Cette étude visait à déterminer la maladie parodontale et à évaluer la relation avec les facteurs associés chez des militaires âgés de 19 à 35 ans.

Patients et méthodes

Une étude observationnelle transversale a été menée du 1er juin 2023 au 15 décembre 2023 en Belgique. 107 participants du Bataillon ISTAR ont été analysés sur leur état parodontal lors du contrôle dentaire annuel selon le STANAG 2466 pour rendre le personnel militaire dentairement apte.

Avant l'examen parodontal, une radiographie panoramique a été prise et les participants ont rempli un questionnaire auto-administré comprenant plusieurs variables épidémiologiques telles que l'âge, le sexe, le niveau d'éducation, le nombre d'obturations ou de caries et les maladies systémiques, par ex. diagnostic des diabétiques.

Un examinateur a évalué l'état parodontal des participants avec une sonde parodontale électronique automatique de 3e génération Pa-on.

Résultats

L'âge moyen des participants était de 25,98 ans. La profondeur moyenne du sondage était de 2,52 mm, l'indice de plaque global était de 32,37 % et le saignement au sondage était de 17,62 %. 38,32 % des sujets ne présentaient aucune poche pathologique. 6,54 % présentaient une parodontite modérée et 55,14 % des sujets présentaient une parodontite légère. Aucune poche supérieure à 6 mm n'a été trouvée.

Il n'y avait pas de corrélation significative entre le vieillissement et les saignements au sondage, et, le vieillissement et l'indice de plaque. Il y avait une augmentation significative de la plaque dentaire avec l'état du parodonte. Les personnes en bonne santé et présentant un parodonte modéré, ont relativement moins de saignements au sondage, et de dents cariées ou obturées que les autres.

Les saignements au sondage entre les deux tranches d'âge (19-23 ans et 31-35 ans) diminuent avec l'âge des soldats. La plaque entre les deux groupes reste élevée et augmente. Il n'y a pas d'amélioration des ratios d'hygiène dentaire. Entre-temps, nous avons constaté une augmentation significative de plus de 75 % du nombre de dents cariées ou obturées. Il y a eu une augmentation moyenne de la profondeur des poches de 11 % entre 19-23 ans et 31-35 ans. Les participants atteints d'une parodontite saine et modérée ont 2,5 fois moins d'obturations ou de dents cariées que les militaires souffrant de gingivite et de parodontite légère.

Conclusion

Nos recherches ont révélé que les jeunes militaires belges n'ont pas des habitudes hygiène bucco-dentaire optimales. Cela signifie que les efforts visant à promouvoir les soins dentaires préventifs doivent être réitérés auprès de la population des jeunes militaires actuels et futurs. Les résultats de l'enquête et les statistiques précises sur la santé servent de base aux accords militaires pour faire des choix sur la manière de les améliorer.

L'étude montre également que les facteurs de risque tels que les saignements au sondage (BoP) jouent un rôle mineur dans la maladie parodontale jusqu'à 35 ans, contrairement à la plaque dentaire, qui augmente chez les soldats aux poches profondes. Mesuré par la mauvaise hygiène bucco-dentaire des jeunes recrues et des soldats plus âgés, la moyenne de l'indice de plaque dentaire évolue peu, mais elle se situe à un niveau élevé. Le nombre d'obturations augmente de plus de 75 pour cent et la profondeur moyenne des poches augmente de 11 pour cent. Il est donc important de fournir des informations et des instructions en matière d'hygiène dentaire aux soldats, même s'ils présentent des formes mineures de destruction parodontale à cet jeune âge.

Mots clés : enquêtes épidémiologiques, statut parodontal, prévalence, saignement au sondage, indice de plaque, armée belge, résultats des risques de parodontite

Introduction

Military combat troops are a high-risk group for oral diseases, because they work under specific physical, psychological and environmental conditions (1).

Early diagnosis is an essential pillar to reduce the number of urgent periodontal interventions in military missions.

Because of preventive measures upon military personnel, such as the STANAG 2466 agreements that are applied in the Belgian army, it has been possible to achieve a noticeable decrease in caries, but the poor level of oral hygiene still remains extremely high in young individuals (3).

Problems arising from poor gingival and periodontal health in military personnel account for around 10% of the emergencies of oral origin during deployments and manoeuvres (2).

The aim of this study was to estimate the prevalence of periodontal disease. In this case, we like to compare our results with other (military) prevalence studies and risk factors.



Materials and Methods

This cross-sectional observational prevalence study analyzed the periodontal condition during the dental annual check-up according STANAG 2466 to make military personnel dentally fit. The survey took place during autumn/winter of 2023. The study population of 107 military personnel belong to the Belgian ISTAR battalion between 19 and 35 years of age. ISTAR stands for intelligence, surveillance, target acquisition and reconnaissance. The majority of these soldiers are younger than 35 years old.

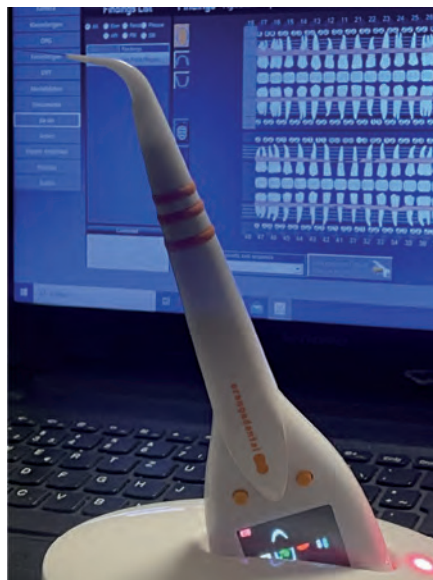
Before the periodontal examination, participants filled in a self-administered questionnaire that included several epidemiological variables such as age, gender, educational level (secondary, college, university) and amount of caries or fillings (DF).

The periodontal clinical data was obtained using an automatic electronic 3rd generation periodontal probe Pa-on (Orangedental, Germany) included: number of absent teeth, pocket depth (PD), gingival recession (REC), bleeding on probing, plaque index (PI) and bone loss index (BL). For biofilm calculation, the most frequent index used is the Silness and Løe plaque index (8).

The exclusion criteria were pregnant women, sick military and military personnel under 18 years and over 35 years old and military personnel who had a previous periodontal treatment, conservative or surgical, within the previous six months. Wisdom teeth were excluded from the study. All the parameters, were scored by one experienced military general practitioner, to avoid inter-examiner bias. For the determination of the plaque index and bleeding on probing, all four surfaces of all teeth (mesial, buccal, distal, oral) were scored. For PD, four sites were measured at every tooth (mesio-buccal, disto-buccal, disto-oral and mesio-oral).

Ethical consideration

The present study was conducted in full accordance with ethical principles, including the World Medical Association Declaration of Helsinki (version 2008) and was reviewed and approved by the Medical Ethics Committee of the Bruggmann Hospital (Ref.: B0772023000065). All participants were informed about the evaluation to which they would be submitted and gave their informed consent for participation.



Measurement rehabilitates

Until now, manual probing is the 'golden standard', but has certain limitations due to inter-individual varying pressures while inserting the probe, different inflammatory conditions of the gingival tissue, wrong angulation of the probe, as well as errors while reading the scale or transferring measurements in the dental record.

The third generation electronic 'Pa-on' periodontal probe (Orangedental, Germany) was used as a measuring instrument as it provides greater precision and accuracy in periodontal screenings (4). No requirement was made to standardize the probing pressure, because before measuring, the program asked to calibrate the probe for each patient.

The Pa-on probe is computer-based, electronic and pressure-calibrated, measurement and calculated the insertion depth with a thin steel tip with a plastic cover at 20 g/0.2 Newton pressure using resistance. Due to a computer-measuring-sequence, tooth-to-tooth data is recorded on a chip and transferred wireless to a periodontal chart. Standard manual probing and the use of an electronic probe correlate very well, albeit PD measurements showed a statistically significant difference, which was below a measuring error of 1 mm (4).

Cases Definition

The European Federation of Periodontology (EFP) and American Academy of Periodontology (AAP) in Chicago in 2017 developed case definitions for periodontal procedures to facilitate the uniformity of the data collection around the world and also to avoid disparities related to different assessments of periodontal variables (5).

However, there is still limited data from epidemiological studies that adopt these diagnostic criteria (6).

A non-periodontitis person in our survey is defined for epidemiological purposes as following:

1. Healthy person: ≤ 10 % bleeding sites with mean probing depths (PD) $< 3,5$ mm (7).
2. Gingivitis is defined as $> 10\%$ bleeding sites with mean probing depths of $< 3,5$ mm.

A periodontitis person is defined as following:

3. Staging of mild periodontitis or stage I periodontitis was measured by calculating interproximal sites with ≥ 3.5 mm PD and < 5.5 mm PD.
4. Moderate periodontitis or Stage II was measured by calculating at least 2 interproximal sites on two or more teeth with PD of ≥ 5.5 mm.
5. Severe periodontitis or stage III was measured by calculating the mean of bone loss (BL) of > 4 mm or loss of 4 teeth or a PD ≥ 6 mm on at least one tooth.

Plaque index (PI) (8). This index is used to identify high-risk patients and monitor the patients' oral hygiene and patient compliance over time. PI is determined dichotomous in all quadrants.

Bleeding on probing (BoP) and plaque index (PI) are simple options that record both the presence of disclosed plaque (biofilm) and the presence of bleeding in a dichotomous manner (13). Both indices focus on interproximal areas that was in general plaque retentive and susceptible to inflammation.

Bleeding on probing is determined by putting the Pa-on probe within the gingival sulcus together with measuring the pocket depth of the papilla from both sides, buccal and lingual. After 20 seconds, the results should be recorded dichotomous as "+" if there is bleeding" or "-" in the absence of bleeding" for every four areas of the tooth.

Statistical Analysis

The data was analyzed using www.socscistatistics.com. A descriptive statistical analysis was performed, evaluating quantitative and qualitative variables were presented as percentages and as mean with standard deviation (SD) and standard error of mean (SEM) through tables.

A chi-square test was carried out, to evaluate the relationship between the stages of periodontal diseases and the amount of decayed and filled fillings (DF), pocket

depth, plaque index and bleeding on probing (Table 4).

For the inferential analysis, the association between the age and plaque index, age and bleeding on probing (7) in both age groups, was calculating using Odds ratio (Table 6).

To find the variation between the two extremes age groups (19-23 and 31-35 years) we used the F-ratio from the ANOVA test (Table 7).

Results

Sociodemographic Data

The sample consisted of 107 military participants. Sociodemographic data of the study participants are shown in table 1. Ninety-three percent of the subjects were male. All the soldiers attended formal education. The majority (89 %) stopped after secondary education (normally in Belgium at 18 years). The mean age of the participants was 25.98 years (SEM=0.43; SD=4.41).

Prevalence and Severity of Periodontal Disease

The clinical characteristics of the military participants are shown in table 2. 25.23 % of the participants had more than 5 mm in depth on one or more teeth. None of the participants had pockets more than 6 mm. 74.77 % had decayed teeth or fillings (DF). The periodontal status of the participants is shown in table 3. The mean probing depth was 2.52 mm (SEM=0.05; SD=0.50). Only 7 of the military participants (6.54 %) had pockets equal or more than 5 mm. The majority (55.14 %) of the military participants had a mild form of periodontitis. None of the participants had pockets more than 6 mm. About half (51.24 %) of the participants are clinically healthy, in this case less than 10 % bleeding on probing.

Prevalence of Periodontal Changes and associated factors of gingivitis and periodontitis

Periodontal pockets were divided into 4 categories corresponding with the periodontal screening index (CPI). 42 of the military participants had no periodontitis (39.25 %). Table 4 shows the characteristics of the study population (n=107) in relation to healthy gum and severity of gingivitis and periodontitis. 25 % of the participants had healthy gum, and another 25 % had gingivitis. Half of the military participants had periodontitis. Caries and fillings increase with the severity of periodontitis,

Table 1: The sociodemographic characteristics of the study participants (n=107)

Sociodemographic characteristics of the military participants.	N = 107
Mean age (years)	25.98
Male	100 (93.46 %)
Female	7 (6.54 %)
Education secondary	95 (88.79 %)
Education college (Bachelor)	5 (4.67 %)
Education university (Master)	7 (6.54 %)

Table 2: Clinical characteristics of the military participants.

Clinical characteristics of the military participants.	N = 107
PD > 5 mm (%) of 1 tooth	12/107 (11.21 %)
PD > 5 mm (%) of 2 or more teeth	15/107 (14.02 %)
PD > 6 mm (%)	0/107 (0.0 %)
Caries or fillings	80/107 (74.77 %)

Table 3: Periodontal Status: mean PD, PI and BoP. Bleeding on probing and pocket depth (PD) after examining of all teeth.

Periodontal Status		n = 107
Mean PD (mm)		2.52 SD= 0.50
Mean PI (%)		32.37 SD= 22.88
Mean BoP (%)		17.62 SD= 35.94
Mean BoP	Absence	18 (16.82 %)
	Presence on <10 % of teeth	34 (31.78 %)
	Presence on >10 % of teeth	55 (51.40 %)
Periodontal Pockets (PD)	0-3.5 mm (0-2)	41 (38.32 %)
	3.5-5 mm (3) mild	59 (55.14 %)
	>5 mm (4) moderate	7 (6.54 %)
	>6 mm severe	0 (0.00 %)

Table 4: Association of age, number of decayed teeth or fillings, mean pocket depth (PD) and mean plaque index (PI) with different periodontal disease severity.

Variables	Severity of Gingivitis and Periodontitis				p value
	Healthy - 10% BoP	Gingivitis + 10% BoP	Mild periodontitis	Moderate periodontitis	
Total (N=107)	26	16	58	7	N/A
Mean Age (years)	24.88	26.80	25.88	26.14	<.05*
Probands with DF	14 (53.85 %)	12 (80 %)	49 (83.05 %)	3 (42.86 %)	<.05*
Number of DF/proband	38 (1.46 DF)	54 (3.60 DF)	264 (4.47 DF)	10 (1.43 DF)	<.05 *
Pocket Depth (PD)	2.12 mm	2.05 mm	3.09 mm	3.22 mm	<.05*
Plaque Index (PI)	17.65 %	30.67 %	38.15 %	42.14 %	<.05*
Bleeding (BoP)	8.15 %	21.66 %	14.98 %	13.00 %	<.05*

* Significant

and decrease by participants with moderate periodontitis. Mean pocket depth and mean plaque index increases with the severity of periodontitis.

There is a statistically significant association between the progress of periodontal disease and aging. (Chi-square (3, N= 107) = 58.7005; p= <.00001), caries or fillings (Chi-square (3, N= 107) = 15.2105; p= .0016), also between progress of disease and number of caries or fillings (Chi-square (3, N= 107) = 18.7254; p= .0003) and periodontal pocket depth (Chi-square (3, N= 107) = 42.3359; p= <.00001).

Between healthy periodontium and periodontal mild and moderate condition is a statistically significant association; plaque index (Chi-square (2, N= 92) = 19.7837; p= <.0001) and bleeding on probing (2, N= 92) = 7.5311; p= 0.0061). Healthy and moderate periodontitis participants have 2.5 times fewer fillings or decayed teeth than military with gingivitis and mild periodontitis.

Relationship between Age and mean Pocket Depth

We compared the mean pocket depth of the youngest participants (19-23-year-olds) with the oldest participants (31-35-year-olds) of the survey. In that time, there was an average increase of 11 % of the mean pocket depth as showing in table 5.

Table 5: Age in relation with mean pocket depth of the youngest and oldest participants.

Age/PD	N	Mean PD
19-23 years	39	2.44 mm
31-35 years	19	2.70 mm

Relationship between Age, BoP and PI

If we look closer at table 6 for the association between age (19-23-year-olds and 31-35-year-olds) and bleeding on probing and age (19-23-year-olds and 31-35-year-olds) and plaque index we found no significant association between the 2 age groups. There was a significant variation found between the number of fillings or decayed teeth and bleeding on probing in the ages from 19-23 year and 31-35-year-olds in table 7. The F-ratio is greater in the younger age group. This means that the variation between decayed teeth or fillings and bleeding on probing greater is than in the older age group. Table 7 shows an almost equal prevalence of bleeding on probing between both age groups. This means we have a much more increase in the number

Table 6: Interferential correlation between age, bleeding on probing and plaque index.

Variables	Age/BoP <10%	Age/BoP >10%	Odds ratio	p Value
19-23 years	21 (53.8%)	18 (46.2%)	1.0500	p= .931
31-35 years	10 (52.6%)	9 (47.4%)		
Variables	Age/PI <40 %	Age/PI >40 %		
19-23 years	29 (74.4%)	10 (25.6 %)	1.6917	p= .381
31-35 years	12 (63.2 %)	7 (36.8 %)		

Table 7: Inferential variation between bleeding on probing and decayed or filled teeth and plaque index and decayed or filled teeth.

BoP/ DF	N	Mean BoP	Mean DF	F-ratio	p Value
19-23 years	39	14.18	2.74	15.647	<.00032 *
31-35 years	19	13.53	4.84	8.987	<.00772 *
PI / DF		Mean PI	Mean DF		
19-23 years	39	31.92	2.74	51.909	<.00001 *
31-35 years	19	34.58	4.84	49.369	<.00001 *

* Significant

of fillings. There is a 75 % increase in caries and fillings between the two age groups. Between plaque index and decayed or filled teeth there is minimal variation between the 2 age groups. There is no improvement in dental hygiene ratios.

Discussion

Until now, no Belgian military periodontal health study exists. Rapid Deployment military personnel are mostly young men. The objective of the study was to identify parameters associated with the onset of periodontal disease in young adults.

In this study the mean pocket depth, BoP and PI was similar to a prevalence survey in Portugal on 172 civilian participants between 18 and 30 years old, mean PD= 2.52 vs 1.85 mm; mean BoP= 17.62 % vs 18.09 %;



mean PI= 32.37 % vs 36.99 % (9). A 2006 Swiss military study of 626 soldiers between 18 and 24 of age found slightly better results in mean pocket depth (2.52mm vs. 2.16 mm) and less deep periodontal pockets of >5 mm (6.54 % vs. 5.2 %). The Belgian soldiers have better averages of bleeding on probing (17.62 % vs. 27 % (4)). Many studies show that pocket depth increases on average with age. In our study we found a mean PD increase of 11 % between the ages 19-23 and 31-35. In 1979 Hugoson and Koch reported an increase of periodontal pockets from 21% at age 20 to 56% at age 30 (10). No significant association was identified between age and plaque or marginal bleeding scores. Gingival bleeding seems not a relevant risk factor. Thus, parameters other than bleeding on probing may be more suitable for periodontal prognostic models in young age groups. We found no pockets larger than 6 mm in our study. In some studies, we found these pockets in 1.3% of the probands (11). In comparison with a recent study of Israeli Army recruits (2016) aged 19.6 years. At least one site with PD >5 mm was found in 20.1% of the Israeli recruits (12). In the present study, the corresponding proportion was, indicated a substantially lower prevalence of periodontitis in the Belgian military. There is a statistically significant variation between the progress of periodontal disease and respectively caries or fillings and periodontal pocket depth. Healthy and moderate periodontitis participants had 2.5 times fewer fillings or decayed teeth than military with gingivitis and mild peri-

odontitis. It shows that oral hygiene is important, but different factors influence caries and the periodontium.

There was an increase in decayed and filled teeth between the young and old age groups. A 2010 Belgian study reported a DMFT in 35- to 44-year-olds of 10.80. Our study evolves to 4.84 for 31-35-year-olds (14). This is probably due to the mandatory annual dental check-up in the Belgian army. Bleeding on probing was high with patients of gingivitis. The plaque index deteriorated with the severity of periodontitis. Bleeding on probing was high with gingivitis patients. Gingival inflammation is often accompanied with gingival swelling, i.e. pseudo-pockets.

There are several shortcomings in this study to compare prevalence between military and civilian studies. Today, young active Belgian military personnel mainly of men. Military (para)medical personnel are an exception. Furthermore, according to the STANAG agreements that Belgium applies in the NATO context, these soldiers must undergo an annual dental check-up, so that theoretically their oral condition should be better than an average population.

The incidence of periodontitis in the present study was assessed based solely on the presence of periodontal probing. Thus, our case definition does not fully adhere to the recommendations proposed by the 2017 World Workshop (15).

We didn't take into account gender, systemic diseases and education level because 6 % of the probands were woman, only 2 probands had a systemic disease and 10% had a higher educational level.

Future research is advisable to study the impact of hygienic and periodontal health promotion to minimize caries in young people and to detect early periodontitis before the age of 35.

Conclusions

Comparing the current study findings with previous studies is not straightforward because of different measures and data interpretation of periodontitis that were used. However, very few data provide a comprehensive assessment of the periodontal status of a population.

Our study showed that young military adolescents don't have optimal oral hygiene habits. This, in turn, means that efforts to promote preventive dental care should be reiterated in the current and future young military population. Study results and ac-

curate health statistics can serve as base findings for the military agreements to make recommendations to improve the military agreements and treatment of the study participants.

The incidence of periodontitis was not an uncommon in young adults. The study also shows that the risk factor "plaque" or biofilm and oral hygiene habits play an important role in the periodontal condition, bleeding on probing play a minor role. Plaque plays a detrimental role in caries management up to 35 years. It is therefore important to provide information and recommendations about dental hygiene and periodontal diseases to younger soldiers, even if they do yet not show any forms of destruction at this age.

As a conclusion, today's dentistry hasn't yet changed from a primarily reparative approach toward a greater emphasis on dental prevention. The foregoing discussion, indicates that little information is available to assess the effect of these delivered dental services. This is particularly true in young adults between ages 19 to 35.

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Competing interests

The author declares he has no conflicting interests.

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