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Impact of Question Wording on the Measurement of Activity Limitation: Evidence From a Randomized Test in France

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Abstract

Objective: The Global Activity Limitation Indicator (GALI), a single question measuring disability, had been introduced in various European surveys since 2004. The complexity of its wording has been questioned. Our study compares alternative variants aiming to simplify the wording. **Method:** We used the Health-Related Opinion Survey run in 2014 in France (*N* = 3,009). Its split sample design allows testing four variants of the questions. We analyzed the prevalence of activity limitation (AL) resulting from the four different constructs of the GALI using multinomial logistic regressions, adjusted for background variables and functional limitations (FLs). **Results:** The alternative GALI variants result in significantly different prevalences

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compared with the original question, in particular for people with FL. The current variant is more inclusive than the routed variants. **Discussion:** Our study suggests limited benefits of changing the GALI construct which do not outweigh the costs of breaking the established chronological series of the current variant.

Keywords
disability, question wording, indicators, Europe, GALI

Context and Objective

Functional health is defined as the consequences of injuries and disabling diseases on functioning in daily life and on quality of life. The functional health model defines the terms disability, handicap, dependency, and impairment which were frequently mixed up before the first conceptual models (Robine, Ravaud, & Cambois, 1997). Models identify these concepts as part of a dynamic process that includes various stages. They correspond to various levels of expression of the consequences of diseases, injuries, or disorders on the body and its functioning, and on a person's daily activities and social integration and participation. In the context of postponed mortality, especially at older ages, and the growing proportion of older people, the conditions of aging draw considerable attention (Rechel et al., 2013).

In the disablement process model (Figure 1), functional limitations (FLs) correspond to the consequences of chronic illnesses or accidents on mental, physical, or sensory functions. FLs hamper people to perform everyday tasks (Verbrugge & Jette, 1994; World Health Organization [WHO], 1980, 2001). In the context of aging societies, public health and social priorities shift to maintain a satisfying level of activity and of social participation. Measuring "activity restriction" or "activity limitations" (ALs) has become a key indicator to monitor the health consequences of aging and to anticipate the needs for care and assistance.

At population level, health and disability are commonly measured in interview surveys because of the high cost and complexity of health examination surveys. The quality of self-reported information depends on the intrinsic quality of the survey instruments. Since the 1960s, the disability level corresponding to AL has been assessed both through various sets of questions dealing with basic and/or instrumental activities of daily life (Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963; Lawton & Brody, 1969) and more recently through global instruments based on a single question dealing with limitations

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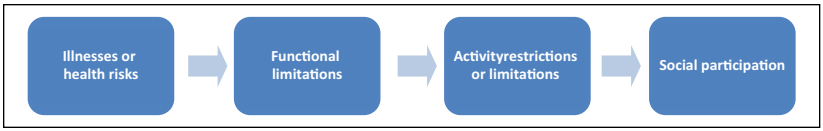

Figure 1. The disablement process, from chronic diseases to limitation in social participation (Verbrugge & Jette, 1994; WHO, 1980).

in usual activities. Global instruments are progressively included in health interview surveys worldwide (Van Oyen, Van der Heyden, Perenboom, & Jagger, 2006). The Global Activity Limitation Indicator (GALI), which is included in the Minimum European Health Module (MEHM) presented in Box 1, is such a global instrument (Cox et al., 2009; Jagger et al., 2010; Robine & Jagger, 2003). The GALI identifies AL using the following question:

Box 1. Eurostat Presentation of the MEHM.

The MEHM is a set of three general questions characterizing three different concepts of health:

- **Self-perceived health** as the self-assessment of a person's own health in general: "How is your health in general? Is it . . ." with answer categories very good/good/fair/bad/very bad.
- **Chronic morbidity** as the presence of long-standing health problems: "Do you have any long-standing illness or health problem?" Yes/no.
- **Activity limitations** as the presence of long-standing activity limitation due to health problems measured via the GALI: "For at least the past 6 months, to what extent have you been limited because of a health problem in activities people usually do? Would you say you have been . . ." with answer categories "severely limited/limited but not severely or/not limited at all?"
- The module was developed to be used in all social surveys and is at present implemented in the European Health Interview Survey (EHIS) and EU Statistics on Income and Living Conditions (EU-SILC). The GALI is present in more surveys, as in the Survey on Health, Aging and Retirement in Europe (SHARE).

Note. Eurostat statistics explained (http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Minimum_European_Health_Module_%28MEHM%29). MEHM = Minimum European Health Module; GALI = Global Activity Limitation Indicator.

> For at least the past 6 months, to what extent have you been limited because of a health problem in activities people usually do? Would you say you have been severely limited/limited but not severely, or/not limited at all?

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From 2004-2005 onward, GALI is included in several official European yearly (European Statistics on Income and Living Conditions [EU-SILC]) or periodic (European Health Interview Survey [EHIS]) surveys. More importantly, the GALI is used to estimate the EU indicator of healthy life years (HLY; life expectancy with and without disability).

The present study has been conducted to explore possibilities to change the wording of the GALI as some European member states find the instrument complex. It explores the possibility to decompose the GALI into a set of filtered and routed questions as well as the impact of ignoring some features of the questions (i.e., reference to duration and/or health relatedness) to shorten it. Changing the wording of the GALI is an important issue because if it alters the measurement properties of the instrument, it will not only cause a break in the time series that has been available since 2004-2005 but may also affect the quality of the instrument by altering its sensitivity and/or specificity. Accordingly, it is essential to measure the extent to which potential alternative wordings will improve the acceptability of the instrument without these negative methodological consequences.

Data and Method

The Sample

We used the health-related French DREES Opinion Survey run every year by the French Bureau for Research, Studies, Evaluation, and Statistics at the Ministry of Health. It is based on face-to-face interviews conducted at home. The sample is set by quota using sex, age, socioeconomic status, and regional and urban stratification. The French Labour Force survey is used as a reference for defining the quota and adjusting the weighting. Face-to-face interviews are conducted by investigators spread over the French territory, so that every region and town size is included. Target households are selected by the interviewers inside their area to fit the quota. The total sample of people aged 18 years-old or more ($N = 3{,}009$) is randomly split into four subsamples with comparable distribution across sociodemographic variables (sex, age, occupation, household size, and region of residence). The questionnaire includes a methodological module of questions with different wordings for each subsample to test variants of self-reported health measures. In 2014, the module comprised the current GALI question and three alternative wordings.

The Current GALI Question

The current wording of the GALI is complex and lengthy because it simultaneously introduces concepts of duration, cause, and severity of the AL

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(Robine et al., 2010). This wording derives from research conducted in the 1990s into instruments for measuring disability and into the quality and properties of existing indicators. This research highlighted the need to target overall AL (Van Oyen et al., 2006): (a) ensuring health relatedness: The reported difficulties are related to health problem(s); (b) no specification or listing of specific areas (work, leisure time, home, etc.); (c) reference of comparison is intrinsic: no comparison with specific age or gender; (d) exclusion of temporary difficulties.

Validation studies have shown that GALI identifies people who have functional problems and who are limited in a number of activities (Berger, Van Oyen, et al., 2015; Cabrero-Garcia & Julia-Sanchis, 2014; Cambois, Robine, & Mormiche, 2007; Cox et al., 2009; Jagger et al., 2010; Verropoulou, 2014) in a similar way across various sociodemographic characteristics and countries (Jagger et al., 2010; Tubeuf, Jusot, Devaux, & Sermet, 2008). GALI predicts mortality (Berger, Van der Heyden, & Van Oyen, 2015; Van der Heyden, Berger, & Van Oyen, 2015) and health care consumption over and above morbidity and self-perceived health, even in the case of moderate limitations (Van der Heyden, Berger, Yokota, & Van Oyen, 2015). Nevertheless, given the complexity there is a risk of loss of information and misunderstanding: Respondents may grasp only part of the instructions and/or interpret the question, and hence selecting their answer, in the light of fluctuating personal criteria.

The different proposed variants aim tackling these problems: sets of filtered and routed questions with either (a) a simplified screening question excluding several concepts such as the health relatedness, the duration of the limitations, and/or its severity; and (b) conditional questions related to the nature of the AL and the level of severity.

Four Variants for Measuring Activity Limitation

The four variants of GALI compared in this study are given in Table 1.

1. The current variant of the GALI question (GALIa) includes duration of the limitations (at least 6 months) and the cause (a health problem), and breaks down responses into three categories, namely not limited, severely limited, and limited but not severely (Sample A).
2. The same wording is used for the GALIb variant, but the previous question in the MEHM on chronic health problems is omitted (Sample B). The main purpose of reducing the MEHM from three to two global questions is to facilitate its introduction in additional European social surveys such as the European Labor Force Survey (Eurostat, 2015). However, it is important to assess whether this suppression

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Table 1. Wording of the Four Variants of the GALI Instrument.

	MEHM	GALI variants
A	1. Self-perceived health 2. Chronic morbidity 3. Activity limitation *GALIa*	**GALIa:** For the past 6 months or more, have you been limited in activities people usually do because of a health problem? *Yes, severely limited/yes, limited, but not severely/no, not limited*
B	1. Self-perceived health 2. — 3. Activity limitation *GALIb*	**GALIb[a]:** For the past 6 months or more, have you been limited in activities people usually do because of a health problem? *Yes, severely limited/yes, limited, but not severely/no, not limited*
C	1. Self-perceived health 2. Chronic morbidity 3. Activity limitation *GALIc*	**GALIc:** Are you limited in activities people usually do? *Yes, severely limited/yes, limited, but not severely/no, not limited* *If yes*: Has this been the case for at least 6 months? *Yes/no* What is the main reason for this limitation? *Health/age/financial reasons/other reasons*
D	1. Self-perceived health 2. Chronic morbidity 3. Activity limitation *GALId*	**GALId:** Are you limited in activities people usually do because of a health problem? *Yes/no* *If yes*: How severe is this limitation? *Severely limited, limited but not severely* For how long have you had this limitation? *Since—years—months*

Note. GALI = Global Activity Limitation Indicator; MEHM = Minimum European Health Module; GALIa = current variant; GALIb = current variant of the GALI question with omission of the question on long-standing health problems; GALIc = information on duration and cause collected from routed questions; GALId = information on severity and duration collected from routed questions.
[a]Current GALI variant but in a reduced two question-MEHM, omitting the chronic morbidity question.

might change respondents' propensity to answer the GALI question. For instance, with no question on long-standing health problems, it could be that people having such conditions would use GALI to report them, even if they are not limited.

3. The GALIc variant is made of three questions: It starts with a screening question in the presence of AL with answer categories mentioning the level of severity. Conditional on a positive answer (the presence of AL), two additional routed questions provide information on duration and health relatedness (Sample C). In the first analysis, we limit

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health relatedness to only those who selected "health" as the cause of the AL. We finally include those who selected "health and/or old age" as the cause for comparing with the other variants.

4. The GALId variant is also made of three questions. It starts with a binary screening question in the presence of a health-related

AL. Conditional on a "yes" answer, two additional routed questions provide information on the severity and duration of the limitation (Sample D). In our analyses, we consider only limitations existing with a duration of at least 6 months, although we performed additional analyses considering short-term AL (Appendix Table A3).

Functional Limitations as a Reference

To understand the impact of changing wording and construct of the measurement, we used a set of independent questions that details functional status. We used the short version (four questions on FL) recommended by the United Nations Washington Group on Disability Statistics (Madans, Loeb, & Altman, 2011).

Box 2. Wording of the Questions Resulting From the Work of the United Nations Washington Group on Disability Statistics.

Do you have difficulty . . .
1. seeing, even if wearing glasses?
2. hearing, even if using a hearing aid?
3. walking or climbing steps?
4. remembering or concentrating?
    1. No, no difficulty/2. Yes, some difficulty/3. Yes, a lot of difficulty/4. Cannot do at all/5. [don't know]

While the FL questions do not vary between samples, they provide a mean of measuring disability regardless of variations in the wording of the GALI question, to (a) assess whether our four samples are comparable in terms of functional profiles and (b) compare the functional profiles of the population identified as having AL according to each of the four GALI variants.

The Washington Group's questions ask the respondent about difficulties in seeing, hearing, walking and remembering or concentrating, offering graded responses ranging from "no difficulty" to "some difficulty," "a lot of difficulty" and "cannot do at all" for each of those functions (Box 2). We constructed a variable summarizing the responses to these four questions in three

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categories. The first comprised of the respondents who did not report any FL, the second consisted of those who reported at least one moderate FL ("some difficulty"), and the third category covered those who reported at least one severe FL ("a lot of difficulty" or "cannot do at all").

These questions on FL cannot be used as a "gold standard" measure of AL measurement as they refer to different stages of the disability process. But they offer a common reference for our four studied variants. Therefore, they allow each of the four GALI measurements to be qualified, for instance to assess whether they modify the propensity of people with (and without) FL to classify themselves as moderately, severely, or not limited in their activity. If the different GALI variants identify individuals with significantly different functional profiles, then we can document how the different variants alter the prevalence of AL.

Based on the disablement process models, we expect that most people who reported AL also reported FL. However the set of questions on FL used does not cover all the functional problems that can be a source of AL. It may be expected that a certain percentage of respondents reporting AL will not report any of these four FL. Nevertheless, how the proportion of AL varies across GALI variants, depending on the FL status, is useful to discuss the capacity of the measure to capture the target population (i.e., its sensitivity) and only the target population (i.e., its specificity). The larger the proportion of individuals who reported AL but none of the four functions included in the WGq, the lower the specificity and the positive predictive value of the GALI variant with respect to these types of FL. Next, we expect that those who experience functional difficulties are more likely to report AL than those who did not. We can comment on the variation in the sensitivity by variant of the GALI; we examined the variation in the proportion of people with FL reporting AL across GALI variants. However, people may find solutions for their functional limitations, so that they are not or no longer hampered by them and will not report an AL. Moreover, FL may be mild or moderate enough for not affecting daily life activities. Therefore, assessing the sensitivity of the GALI questions in a cross-sectional study without health examination is not really possible. We therefore focus on the ability of the variants to identify people among those with FL, especially the severe ones.

Analysis

In each subsample, we estimated AL by severity level if the reported duration was "for at least 6 months" and the limitation "due to health problems," directly for variants GALIa and GALIb and by combining the answer categories of the routed questions for the variants GALIc and GALId.

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Table 2. Distribution of the Subsamples Across Functional Profiles: France, 2014 (DREES Opinion Survey).

	Samples				
	A	B	C	D	Total
Functional status					
*Not reported**	*1*	*1*	*1*	*3*	*6*
No functional limitation (%)	60	60	61	63	61
At least one functional limitation (%)	40	40	39	37	39
*of which only moderate (%)***	*29*	*31*	*28*	*28*	*29*
*of which severe (%)***	*11*	*9*	*11*	*8*	*10*
	100	100	100	100	100
Sample sizes	760	753	740	756	3,009

Note. *Excluded from the analysis.
**Decomposition of the percentage of fonctional limitations across the severity levels.

In the first step, we compare the distribution of the prevalence of AL within the four samples across the FL profile. Although the four samples reveal a degree of homogeneity, the accumulation of small divergences may still result in significant differences. Therefore, in a second step, we use multivariate models to better document how changing the GALI wording may modify the AL measurement, according to the FL profile while adjusting for age, sex, region, and employment status. We replicate the analysis to compare the patterns across gender, age groups, and levels of education.

Results

The Functional Profiles in the Four Samples

The total sample of the survey comprises 3,009 individuals, the four samples being 740 to 756 individuals each, with a comparable age, sex, region, and employment status distribution (Appendix Table A1) and FL distribution (Table 2); 39% reported at least one FL of which a quarter of the reported FL were severe. The prevalence of FLs was slightly less in Sample D. However, Pearson's chi-square indicates that they cannot be considered as significantly different (p value = .39).

The Prevalence of AL Across GALI Variants

Compared with the current GALI (GALIa), the AL prevalence is slightly but significantly lower using GALIc (p = .013) and GALId (p = .033) variants

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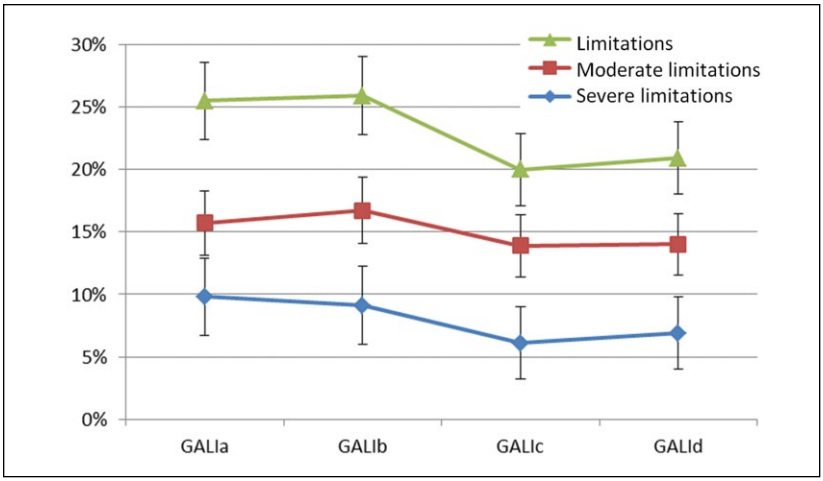

Figure 2. Prevalence rates for ALs by severity levels using each variant of the GALI question: France, 2014 (DREES Opinion Survey).
Note. AL = activity limitation; GALI = Global Activity Limitation Indicator; GALIa = current variant; GALIb = current variant of the GALI question with omission of the question on long-standing health problems; GALIc = information on cause and duration collected from routed questions; GALId = information on duration and severity collected from routed questions.

(Figure 2). The prevalence rates by severity level indicate that GALIa and GALIb identify more people, whatever the level of severity.

The survey confirms a high prevalence of FL among respondents who reported AL (from 80%-82%) compared with those who reported no AL (25%-28%; Table 3). The GALIa and GALIb variants of the question elicited slightly larger percentages than the other two variants. The GALIa variant found more people with AL at each level of functional limitation, except moderate limitation where GALIb elicited a larger number, although the difference is not statistically significant.

Next, we assessed whether, for a given level of functional limitation, the prevalence of AL remained the same whatever the wording of the GALI (Appendix Table A2). Between 29% and 33% of those who had FLs at any level of severity reported AL, and 15% to 22% of these were classified as severe. Among individuals who reported severe FL, the prevalence of severe AL is significantly lower using the GALIc variant compared with GALIa. This seems to be consistent with findings suggesting combining health problems and "old age" as causes of limitations in our subsequent analyses of GALIc sample.

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Table 3. For Each Variant of the GALI Question, Distribution of the Respondents With and Without ALs by the FL Profile: France, 2014 (DREES Opinion Survey).

	A	B	C	D	Total
Functional limitation profile of respondents with activity limitations					
No functional limitation (%)	20	18	19	18	19
Moderate functional limitation (%)	48	56	50	53	52
Severe functional limitation (%)	32	26	30	29	29
Sample size	194	195	149	157	694
Functional limitation profile of respondents without activity limitations					
No functional limitation (%)	73	74	72	75	74
Moderate functional limitation (%)	23	23	22	22	22
Severe functional limitation (%)	4	3	6	3	4
Sample size	565	557	590	594	2,306

Note. GALI = Global Activity Limitation Indicator; AL = activity limitation; FL = functional limitation.

Including "Old Age" as Health-Related Cause of Activity Limitations Using the GALIc Variant

The GALIc variant serves to analyze the impact of answering the cause of the AL afterward, while GALIa refers to the heath relatedness of AL; 79% of the reported AL in GALIc mentioned health, and 15% old age. People experience more health problems in old age, but it does seem that a quite significant number of respondents within this sample ascribe their AL primarily to old age rather than health issues. One percent of the sample cited financial reasons, and 6% chose the "other reasons" option. In Table 4, we added together people who cited health and old age in response to the GALIc question: The prevalence rate we obtained is closer to the figure resulting from the question in its current form (GALIa).

If we focus on the total prevalence for all levels of severity, the statistics reveal that AL prevalence is comparable, producing a p value of .52. If the levels of severity are taken into account, it emerges that the prevalence of severe AL elicited by the GALIc variant remains lower, even after inclusion of the respondents who cited old age (raising the rate from 6%-7%), compared with 10% for the GALIa variant. This lower prevalence can be due to the effect of the filtered question which does not refer to the health relatedness of the AL; 7% of the positive answers were attributed to causes other than health, which might include personal or contextual factors (feel limited in activities due to financial difficulties, interrelation problems, lack of given

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Table 4. Changes in Prevalence Rates in Sample C if Limitations on Grounds of Health and Old Age Are Combined: France, 2014 (DREES Opinion Survey).

	GALIa	GALIc Health	GALIc Health and old age
No activity limitation (%)	75	80	76
Activity limitations (%)	26	20	24
*of which moderate (%)**	*16*	*14*	*17*
*of which severe (%)**	*10*	*6*	7

Note. GALIa = current variant; GALIc = information on cause and duration collected from routed questions.
*Ecomposition of the percentage of fonctional limitations across the severity levels.

skills, lack of time, lack of public transports, geographical distance to shops, theaters, sporting equipments, etc.). This wider (not health-related) interpretation of the question might have induced a number of people to report limitation and to report no limitation with such references in mind, whatever their status regarding health-related AL.

Specifying or Not the Duration of the Activity Limitations

In the GALIa and GALIb variants, the duration of the AL is mentioned in the question. To shorten and simplify the wording, the GALIc and GALId variants do not mention the duration clause in the screening question. Information on duration is collected in the following step, only among those who answered positively to the screening question. Using the GALIc variant, 12% of those who were screened have short-term AL (less than 6 months), respectively, 14% and 10% among those who reported moderate AL and severe AL (Table 5).

When grouping the long-term and short-term limitations from the GALIc variant, we found that the AL prevalence increases and becomes (not significantly) higher than the GALIa variant (19% vs. 16%) for AL all levels combined, while it remains (not significantly) smaller (8% vs. 10%) for the severe levels. Adding the short-term limitations seems to bring in more moderate level of AL; for severe AL, the GALIc variant continues to underestimate the prevalence of AL.

GALId variant brings different results, while it happens to capture essentially long-term AL, whatever the level of severity of the AL. In other terms, it does not seem worth mentioning the duration clause in the screening question in the GALId variant, while it does in the GALIc variant. The GALId variant refers to the health problem as cause of the limitation in the screening question, while GALIc does not. Note, however, that the wording of the

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Table 5. Duration of the AL Reported Using the GALIc and GALId Variants: France, 2014 (DREES Opinion Survey).

	GALIc (caused by health + old age)		GALId	
	AL > 6 months	AL < 6 months	AL > 6 months	AL < 6 months
AL (all levels combined) (%)	88	12	98	2
Severe AL (%)	90	10	98	2
Moderate AL (%)	86	14	98	2

Note. AL = activity limitation; GALIc = information on cause and duration collected from routed questions; GALId = information on duration and severity collected from routed questions.

routed question on duration is quite different in both variants, GALId (open answer category) and GALIc (binary with cutoff at 6 months).

Multinomial Modeling of the Probability of Reporting Activity Limitations

The multinomial models, adjusting for age, sex, and education, were run for the total study population with an additional adjustment on FL and separately stratified by FL. In Model 1, the reference is "no AL," and in Model 2 it is "moderate AL" (Table 6). GALIc and GALId significantly reduce the likelihood of reporting severe AL rather than none in comparison with GALIa. GALIc significantly reduces the likelihood of reporting severe AL rather than moderate ones. Those with no FL are less likely to report severe AL than no AL using GALId than using GALIa. Those with moderate FL are less likely to report severe rather than moderate AL using GALIc than using GALIa. Other (not significant) results generally suggest a lower propensity to report severe AL using GALIc and GALId compared with GALIa. An additional analysis shows a higher propensity using GALIc to report moderate AL and lower propensity to report severe AL compared with GALIa (Appendix Table A3).

Variant GALIb differs from the GALIa variant by discarding the question relating to long-standing health problems that precedes the measurement of AL through the GALI in the MEHM (Table 6). Analyzing the data by limiting the sample to particular FL profiles, we also observed that respondents with moderate FL using GALIb were more likely than when using GALIa to report moderate AL rather than reporting no AL (Model 1); this effect was significant at a 10% threshold. This effect is consistent with the hypothesis that

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Table 6. Odds Ratio for Reporting of a Moderate or Severe AL (as Opposed to No Limitation) According to Each Wording of the GALI Question (Pooled Samples)—Multinomial Logistic Regression: France, 2014 (DREES Opinion Survey).

	All (n = 2,986)			No functional limitations (n = 1,776)			Moderate functional limitations (n = 900)			Severe functional limitations (n = 310)		
	No limitations	Moderate activity limitations	Severe activity limitations	No limitations	Moderate activity limitations	Severe activity limitations	No limitations	Moderate activity limitations	Severe activity limitations	No limitations	Moderate activity limitations	Severe activity limitations
Model 1: Ref. = no activity limitation reported												
A (GALIa)		Ref.			Ref.			Ref.			Ref.	
B (GALIb)	1.00	1.14	0.98	1.00	0.77	1.06	1.00	1.44**	0.99	1.00	0.89	0.85
C (GALIc)	1.00	1.13	0.67**	1.00	1.19	0.51	1.00	1.25	0.66	1.00	0.80	0.66
D (GALId)	1.00	0.90	0.69**	1.00	0.74	0.32**	1.00	1.07	0.67	1.00	0.92	0.85
Model 2: Ref. = moderate activity limitations reported												
A (GALIa)		Ref.			Ref.			Ref.			Ref.	
B (GALIb)	0.87	1.00	0.86	1.30	1.00	1.38	0.69**	1.00	0.69	1.12	1.00	0.96
C (GALIc)	1.21	1.00	0.60*	0.84	1.00	0.43	0.80	1.00	0.53**	1.24	1.00	0.82
D (GALId)	1.10	1.00	0.76	1.35	1.00	0.44	0.94	1.00	0.63	1.08	1.00	0.93
Adjustment of Models 1 and 2	Functional limitations + age, sex, educational attainment level, and employment status			Age, sex, educational attainment level, and employment status			Age, sex, educational attainment level, and employment status			Age, sex, educational attainment level, and employment status		

Note. The reference is the odds ratio for the members of Sample A reporting severe or moderate activity limitations rather than reporting no limitations, all other things being equal (adjustment for sex, age, educational attainment level, and employment status). Interpretation: In Sample D, respondents have a lower propensity than those in Sample A to report that their activity is severely limited rather than not limited (Model 1). This effect is significant at the 10% threshold. AL = activity limitation; GALI = Global Activity Limitation Indicator; GALIa = current variant; GALIb = current variant of the GALI question with omission of the question on long-standing health problems; GALIc = information on cause and duration collected from routed questions; GALId = information on duration and severity collected from routed questions. $^{*}p \leq .5$. $^{**}p \leq .1$. $^{***}p \leq .01$.

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some answers from respondents with long-standing health problems are carried over into a higher likelihood to report AL when the long-standing health problems question is not proposed.

We further repeated the models stratifying by sex, age group, and level of education (Appendix Table A4). People with a low level of education and women are more likely to report moderate rather than no AL using GALIb. Using GALIc, people with a low level of education are more likely to report moderate rather than both no AL or severe AL, people with a lower degree than the French Baccalaureate are more likely to report no AL rather than moderate AL, and finally people with the French Baccalaureate or a higher degree, and those less than 50 years old are less likely to report severe rather than moderate AL. Men are less likely to report severe rather than moderate AL using GALIc. Using variant GALId, people with the French Baccalaureate or people aged above 65 years are less likely to report severe AL compared with the variant GALIa.

Discussion

Following the recommendations of the international working group of the European Joint Action on Healthy Life Years (Berger & Van Oyen, 2014; Robine et al., 2013), this study compared four variants of the GALI question. We observed lower prevalence rates for the filtered and routed variants GALIc and GALId, and similar prevalence rates for the GALIb compared with the current variant GALIa. The multinomial analyses suggest different processes that lead to these differences, involving functional limitations, gender, educational attainment, and age which can impact the propensity to report no, moderate, or severe AL depending on the GALI variant.

In the GALIc variant, the screening question does not refer to the health relatedness of the cause of the AL or the duration of the limitations. When reconstructing a comparable AL prevalence concept by selecting the long-term duration and combining health and old-age-related limitation, the prevalence, especially of severe AL, remains significantly lower. When the cause is not mentioned in the screening question, the vast majority of the reported limitations are due to health problems. However, 15% considered that their limitations are due to old ages and 7% due to other causes. Possible causes should not be exclusive, as it is not possible to identify the AL that might be due to the combination of several causes. Adding “health-related” and “old age” causes together does not allow reaching the level of AL prevalence found with the current GALIa variant.

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Furthermore, comparing GALIc and GALId variants, we found that the health condition mentioned in the screening question of the GALId could be a mean for selecting long-term AL while in GALIc, 12% of those who reported AL and mentioned a posteriori "health-related" and "old age" causes specified that they had short-term limitations. If we consider both the short- and long-term AL, the AL prevalence in GALIc increases due to an increase in moderate AL but not the severe ones. The results further bring light of the duration condition. If the question comprises a health-relatedness condition, but not a duration condition (GALId), the reported ALs are almost all long-term AL. This finding suggests that dropping the duration could be a possible option to simplify the current GALIa wording.

The multinomial analyses reveal significant variations in the mechanisms that lead to the differences observed in the prevalence rates. We found a lower propensity to report severe AL using GALIc and GALId, and more specifically using GALIc for those with severe FL. This corresponds with a reduced sensitivity to identify subjects with AL for these two variants of the GALI among subjects with FL. However, we also found a lower propensity to report AL among those who reported no FL using GALId compared with GALIa, suggesting a lower specificity for the current GALIa variant. It is not possible to determine whether these "extra-cases" elicited by the GALIa are actually "false positives," particularly among those who did not report FL (or false negatives elicited by GALIc and GALId). There are obviously people whose activities are limited by functional difficulties other than those measured in this survey.

A number of studies have shown that AL prevalence measured by the current GALIa variant and its severity levels is associated with health consumption and mortality outcomes in the years following the surveys (Berger, Van der Heyden, & Van Oyen, 2015; Van der Heyden, Berger, & Van Oyen, 2015; Van der Heyden, Berger, Yokota, et al., 2015). These studies suggest a good sensitivity and specificity of the GALIa wording.

Explanations for a possible reduction of sensitivity, resulting in a lower prevalence of AL, for the filtered and routed questions (GALIc or GALId) could be the missing health-related clause in the screening question of GALIc, which might open the understanding of the question to other types of limiting factors than health as mentioned earlier. The screening questions are simpler but are less focused on the target issues. Being less targeted to health issues seems to reduce the propensity of reporting AL (possibly even when health-related AL is present). Mentioning the health relatedness possibly orients respondents better toward disability.

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In addition, the GALId wording with a "yes-no" answer category (instead of levels of severity) might induce a self-censorship effect. The "yes-no" categories eliminate an in-between option, forcing people to make strong choices. It could result in a number of people with mild or moderate disability minimizing the severity of their limitations, thereby changing the way in which people categorize their AL reporting compared with the wording of the current GALIa (a number of people with moderate AL answering *negatively* to the screening question and, among those who answered positively, a number of people with severe AL reporting being *moderately limited* in the following question).

The GALIb variant, discarding the question on long-standing health problems, increases the propensity of respondents with FL to report moderate AL. Removing the question relating to long-standing health problems seems to result in an overestimation of AL, although moderate, probably with the inclusion of respondents who might have reported long-standing health problems but no AL with the current variant of the MEHM. The question on chronic morbidity serves to well distinguish health problems from their functional consequences; accordingly, some respondents affected by such long-standing illness would be using the GALI question to report their health problems.

Our study shows that GALIa selects more individuals reporting AL, especially among those who report FL, particularly severe FL. The results do not suggest a better understanding of the simplified variants compared with the current GALIa variant. Our study shows that a change in wording of the GALI will result in a break in the time series starting in 2004-2005. In addition, the variants assessed in this study are less sensitive, particularly for severe FLs. But without a physical health examination, we could not explore whether the variants are finally even more specific as the survey instrument used to measure FL is limited to a selection of four functions. Our study suggests that omitting the duration could be a likely option, in contrast to the omission of the health relatedness. Replication of this study in other settings and other languages, as well as with other wording options, should help confirming and refining our conclusions. The three alternative variants of the GALI used in this study help understanding the complexity of changing the wording of a current standard GALI question.

The GALI has been used since 2004 as a main common indicator in Europe, especially the GALI is the measure underlying the European indicator HLY. Therefore, we call for caution as regards any change to the wording of the GALI, and we should ensure that any change in the instrument should lead to a better measurement of AL in a population.

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Appendix

Table A1. Distribution by Employment Status of Respondents With and Without Activity Limitations for Each Variant of the GALI Question: France, 2014 (DREES Opinion Survey).

	A	B	C	D	Total
Employment status of persons in the full samples					
Full-time work (%)	37	37	36	40	38
Part-time work (%)	7	8	7	7	7
Intermittent work (%)	2	2	1	2	2
Jobseeker (%)	11	11	11	10	11
Student (%)	5	4	5	6	5
Retired or semi-retired (%)	30	29	30	29	29
Not working (%)	9	9	9	7	9
	100	100	100	100	100
Employment status among people who reported activity limitations					
Full-time work (%)	19	23	20	23	21
Part-time work (%)	2	6	6	6	5
Intermittent work (%)	3	2	0	1	2
Jobseeker (%)	13	8	13	10	11
Student (%)	0	1	2	3	1
Retired or semi-retired (%)	47	44	44	44	45
Not working (%)	16	16	15	13	15
Sample sizes	194	195	149	157	694
Employment status among people who reported NO activity limitations					
Full-time work (%)	43	42	40	44	42
Part-time work (%)	8	9	7	8	8
Intermittent work (%)	2	2	2	2	2
Jobseeker (%)	10	12	11	10	10
Student (%)	7	5	6	7	6
Retired or semi-retired (%)	24	23	26	25	24
Not working (%)	6	7	8	5	7
Sample sizes	566	558	591	599	2,315

Note. GALI = Global Activity Limitation Indicator.

Table A2. Prevalence of AL in Each Sample by Reported Level of Functional Limitation: France, 2014 (DREES Opinion Survey).

	Sample				
	A	B	C	D	Total
Among those with no functional limitations					
No activity limitation (%)	91	92	94	94	93
Moderate activity limitation (%)	7	6	6	5	6
Severe activity limitation (%)	2	2	1	1	1
Sample size	454	448	453	475	1,830

(continued)

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Table A2. (continued)

	Sample				
	A	B	C	D	Total
Among those with functional limitations					
No activity limitation (%)	49	48	58	53	52
Moderate activity limitation (%)	29	33	27	29	29
Severe activity limitation (%)	22	19	15	18	19
Sample size	304	304	286	277	1,171
Among those with moderate functional limitations					
No activity limitation (%)	58	54	64	61	59
Moderate activity limitation (%)	29	35	28	30	31
Severe activity limitation (%)	13	11	8	9	10
Sample size	221	236	208	213	877
Among those with severe functional limitations					
No activity limitation (%)	26	26	42	27	31
Moderate activity limitation (%)	27	26	24	26	26
Severe activity limitation (%)	47	48	33	46	44
Sample size	84	68	78	64	294

Note. AL = activity limitation.

Table A3. Odds Ratio of Moderate or Severe Activity Limitation—Including Short- and Long-Term Limitations—(as Opposed to No Limitation) in Response to Each Wording of the GALI Question (Pooled Samples): France, 2014 (DREES Opinion Survey).

	All (n = 2,986)		
	No limitations	Moderate activity limitations	Severe activity limitations
Model 1: Ref. = no activity limitation reported			
A (GALIa)		Ref.	
B (GALIb)	1 (ref)	1.15	0.99
C (GALIc)	1 (ref)	1.47*	0.97
D (GALId)	1 (ref)	0.94	0.72
Model 2: Ref. = moderate activity limitations reported			
A (GALIa)		Ref.	
B (GALIb)	0.87	1 (ref)	0.86
C (GALIc)	0.68	1 (ref)	0.66**
D (GALId)	1.07	1 (ref)	0.77
Adjustment of Models 1 and 2	Functional limitations + age, sex, educational attainment level, and employment status		

Note. The reference figure is the odds ratio for the members of Sample A reporting severe or moderate activity limitations rather than not reporting them, all other things being equal (adjustment for sex, age, educational attainment level, and employment status). GALI = Global Activity Limitation Indicator; GALIa = current variant; GALIb = current variant of the GALI question with omission of the question on long-standing health problems; GALIc = information on cause and duration collected from routed questions; GALId = information on duration and severity collected from routed questions.
* $p \leq .5$. ** $p \leq .1$. *** $p \leq .01$.

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Table A4. Odds Ratio for Reporting of a Moderate or Severe Activity Limitation (as Opposed to No Limitation) in Response to Each Wording of the GALI Question (Pooled Samples)—Multinomial Logistic Regression by Sex, Age Group, and Educational Attainment: France, 2014 (DREES Opinion Survey).

	Men			Women		
	No limitations	Moderate activity limitations	Severe activity limitations	No limitations	Moderate activity limitations	Severe activity limitations
Model 1: Ref. = no activity limitation reported						
A (GALIa)		Ref.			Ref.	
B (GALIb)	1.00	0.82	0.75	1.00	1.58*	1.36
C (GALIc)	1.00	1.18	0.64	1.00	1.10	0.71
D (GALId)	1.00	0.93	0.72	1.00	0.88	0.68
Model 2: Ref. = moderate activity limitations reported						
A (GALIa)		Ref.			Ref.	
B (GALIb)	1.22	1.00	0.91	0.63*	1.00	0.86
C (GALIc)	0.85	1.00	0.55**	0.91	1.00	0.65
D (GALId)	1.08	1.00	0.77	1.14	1.00	0.77

Note. Adjustment on functional limitations + age, educational attainment, and employment status. GALI = Global Activity Limitation Indicator; GALIa = current variant; GALIb = current variant of the GALI question with omission of the question on long-standing health problems; GALIc = information on cause and duration collected from routed questions; GALId = information on duration and severity collected from routed questions.

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	More than 50 years old			50-64 years old			More than 65 years old		
	No limitations	Moderate activity limitations	Severe activity limitations	No limitations	Moderate activity limitations	Severe activity limitations	No limitations	Moderate activity limitations	Severe activity limitations
Model 1: Ref. = no activity limitation reported									
A (GALIa)		Ref.			Ref.			Ref.	
B (GALIb)	1.00	1,17	0,69	1.00	1,14	1,36	1.00	1,14	0,98
C (GALIc)	1.00	1,18	0,47*	1.00	1,03	0,77	1.00	1,21	0,84
D (GALId)	1.00	0,93	0,63	1.00	1,00	0,96	1.00	0,73	0,53**
Model 2: Ref. = moderate activity limitations reported									
A (GALIa)		Ref.			Ref.			Ref.	
B (GALIb)	0,85	1.00	0,59	0,88	1.00	1,20	0,88	1.00	0,86
C (GALIc)	0,84	1.00	0,40*	0,97	1.00	0,75	0,83	1.00	0,70
D (GALId)	1,07	1.00	0,68	1,00	1.00	0,96	1,36	1.00	0,72

Note. Adjustment on functional limitations + educational attainment, sex and employment status. GALIa = current variant; GALIb = current variant of the GALI question with omission of the question on long-standing health problems; GALIc = information on cause and duration collected from routed questions; GALId = information on duration and severity collected from routed questions.

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	No (or lowest) diploma			Diploma below Baccalaureate			Baccalaureate			Diploma above Baccalaureate		
	No limitations	Moderate activity limitations	Severe activity limitations	No limitations	Moderate activity limitations	Severe activity limitations	No limitations	Moderate activity limitations	Severe activity limitations	No limitations	Moderate activity limitations	Severe activity limitations
Model 1: Ref. = no activity limitation reported												
A (GALIa)		Ref.			Ref.			Ref.			Ref.	
B (GALIb)	1.00	2,20*	1,24	1.00	0,99	1,12	1.00	1,67	0,78	1.00	0,69	0,53
C (GALIc)	1.00	2,68***	1,03	1.00	0,63**	0,57	1.00	1,59	0,87	1.00	1,09	0,32**
D (GALId)	1.00	1,26	0,78	1.00	1,02	0,89	1.00	0,91	0,23*	1.00	0,64	0,45
Model 2: Ref. = moderate activity limitations reported												
A (GALIa)		Ref.			Ref.			Ref.			Ref.	
B (GALIb)	0,45*	1.00	0,56	1,01	1.00	1,14	0,60	1.00	0,47	1,45	1.00	0,76
C (GALIc)	0,38*	1.00	0,39*	1,59**	1.00	0,90	0,63	1.00	0,55	0,92	1.00	0,30**
D (GALId)	0,79	1.00	0,62	0,99	1.00	0,87	1,10	1.00	0,26**	1,56	1.00	0,71

Note. Adjustment for functional limitations + age, sex, and employment status. The reference figure is the odds ratio for the members of Sample A reporting severe or moderate activity limitations rather than not reporting them, all other things being equal (adjustment for age sex, employment status, and either sex or educational attainment level). GALIa = current variant; GALIb = current variant of the GALI question with omission of the question on long-standing health problems; GALIc = information on cause and duration collected from routed questions; GALId = information on duration and severity collected from routed questions.
*$p \leq .5$. **$p \leq .1$. ***$p \leq .01$.

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