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Coping or caring for functional limitations: does it change the risk of severe restriction in personal care activities?

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Women over age 55 have more severe restrictions for personal care activities than men but, when controlling for functional status, gender differences fade away after age 70 and even turn to women's advantage below this age. This study shows that women and men have different compensatory strategies facing functional problems ; men more often use assistive devices while women more often benefit from someone's help. Functional status being equal, the risk of severe restriction is higher when human assistance is reported rather than technical assistance only. Within the households population, among people with physical or sensory limitations, the probability of using no help or technical devices only is correlated with being independent, whatever the severity level of the limitation; but for women, using human assistance only is also correlated with remaining independent for personal care activities. Despite the limits of the data, it seems that there are different practice to cop with limitations, changing with age and sex. The study discusses different ways to interpret these findings.

Men and women have differentiated risks of facing difficulties in performing alone personal care activities (Cambois et al., 2003a). Understanding why could help in developing actions to prevent more people from becoming dependent from the assistance of others in daily life. Recent work on the disablement process has shown that functional limitations (to see, walk, climb stairs…) may be viewed as a predictive stage of activity restriction (in personal care, work, social activity…) and, potentially, of dependency (Cambois et al., 2003b) . The present study aims to look at possible explanations for gender disparities in the disablement process by paying attention to various factors : (1) to look at the types of functional problems men and women are exposed to, (2) to find out to what extend these functional problems lead differently to activity restrictions for both sexes, (3) to assess if a differentiated use of assistive devices and human help can impact on the differentiated risk of activity restriction.

METHOD AND DATA

Cognitive, physical or sensory functional limitations are linked to individual's organism dysfunction (difficulties in seeing, walking, remembering…): direct consequences of impairments, they determine its functional status regardless, in theory, of the environment or the technical support at its disposal. Activity restrictions correspond to the individual's dysfunction in his/her activities (personal care, household activities, work…) and depend on his/her functional status and environment. Besides the fact that most of the studies rely on measurement tools allowing to distinguish them, both concepts prove to be operational to bring to the fore the dynamic nature of the process: functional limitations represent a predictive stage of activity restrictions (Fried *et al.*, 1996 ; Lawrence *et al.*, 1996 ; Harwood, 1998 ; Tager, 1998) , especially those involving lower limbs (Lawrence *et al.*, 1996 ; Manton *et al.*, 1998, Wolinsky *et al.*, 1991) or cognitive functions (Steen *et al.*, 2001 ; Freedman *et al.*, 2001).

a. "*Handicaps-incapacités-dépendance* Survey (HID)

The HID survey is a longitudinal study covering the whole French population (standard households and institutions). It consists in two waves within two years. The first wave –on which this study is based- has been carried out in 1998 with the population living in institutions (about 15 000 interviews) and with the household population in 1999 (16 500 interviews). The sample was randomly constituted among all the institutions and their residents: they include nursing homes, with medical support or not, institutions for disabled adults, mental health institutions and care units as well as long term hospitalisation units. In the institutions having accepted the survey, the response rate among the residents is 95 %. The sample of households stems from a questionnaire (Vie Quotidienne et Santé), assigned to 400 000 people during the 1999 census. This questionnaire was devoted to screen for people with functional problems so to be over-represented in the HID survey. The response rate among standard households is 77,8 %. The questionnaires are managed "face to face" and the respondent could be helped or replaced by a proxy if needed. People using proxy are often do due to health problems and it appears through studies that proxy tends to report more functional problems and restrictions than people do for themselves (Rubenstein *and al*., 1984 ; Kovar *et al*., 1994). Therefore the replies given by the subjects for themselves and by proxies are quite different; but turning to proxy avoids the exclusion of people in bad health who are the very object of the survey. In this study, both types of replies are assimilated.

The questions of the HID survey mainly cover physical and sensory functional limitations. For this study we only keep limitations likely to bring about restrictions in the personal care activities. Thus, although frequent, auditory functional limitations were not kept because of their weak relation with restrictions in personal care activities; yet they were retained in the exploratory study and we will get back to this point in the discussion. Cognitive functional limitations are not easy to gauge through interviews and are usually rather assessed by *ad hoc* tests (see for example Felstein, 1975). However we will use a question about difficulties with orientation in time, that denote important cognitive problems. Indicators were built on the base of eight questions about those three dimensions of the functional state (Box 1).

With regards to activity restrictions, five questions from the HID survey were retained to build a first indicator of restrictions for elementary activities of daily living, on the basis of Katz indicator(1963); we excluded the question about incontinence found in Katz, question being more relevant to impairments. Restrictions for such basic activities that cannot be delegated to others identify individuals strongly at risk of requiring daily assistance to ensure what WHO calls "minimal independence" (WHO 1980). Moreover, difficulties in performing other types of activity (household or professional activities) can be linked to different causes other than health ("know-how", working conditions, tasks organisation within the household…) while difficulties for personal care are more closely linked to functional problems; this more exclusive relation allows us to describe more efficiently the course of the functional decline process, meanwhile the relations between functional limitations and activity restrictions emerging from the study will be specific to personal care activities and cannot be systematically applicable to other kinds of activity.

Box 1 : Questions in the HID survey to assess functional limitations and activity restrictions (questionnaires « households » and « institutions » surveys)

ENSORY FUNCTIONAL LIMITATIONS Can you see closely, with glasses if applicable? (to read newspapers, a book, to draw, to do crosswords...) */ yes with no difficulty vs other answer categories* 2- Can you recognize somebody's face from 4 meters distance? (with glasses if applicable) */ yes with no difficulty vs other answer categories* PHYSICAL FUNCTIONAL LIMITATIONS *Suppleness and handling :* - Can you use your hands and fingers without problems? (for instance open a door, handle the tap, hold a pencil, use scissors…) */ yes with no difficulty vs answer categories* - Can you cut your toenails without any help?*/yes with no difficulties vs other answer categories + 4 limbs deficient* - When you stand, can you lean over and pick up an object on the floor (for example a shoe) ? */ yes with no difficulties vs other answer categories + 4/2 limbs deficient +confined in bed* *Locomotion :* - Can you walk up and down the stairs without assistance? *yes with no difficulties vs other answer categories + confined in bed* - Can you move around the different rooms without assistance? */ Yes, with no assistance vs other answer categories + wheelchairs+ confined in bed* OGNITIVE FUNCTIONAL LIMITATIONS - Have you ever forgotten which time of the day it is ?*/ No never vs other answer categories*	PERSONAL CARE (ADL TYPE ITEMS) - Once food is ready, do you eat and drink? /*Yes with neither assistance nor difficulty/ without help but with difficulties / other answer categories + put on an IV* - Can you completely dress and undress without assistance? / *Yes with neither assistance nor difficulty / without help but with some difficulties / other answer categories* - Do you usually wash on your own? / *Yes with neither assistance nor difficulty / without help but with difficulties / other answer categories* - Can you get in and out of bed / *Yes with neither assistance nor difficulty / without help but with some difficulties / other answer categories + confined in bed* - Can you go to the toilets without help ?/ *Yes with neither assistance nor difficulty / without help but with some difficulties / other answer categories*

Missing replies to questions were studied item per item and reclassified according to the answers given to other questions, when possible. In the absence of additional information, they were considered as missing data for prevalence rate calculations, what comes down to apply to individuals not having replied the prevalence rate obtained from clear answers. Severe activity restriction is defined as reporting "many difficulties" or "need for assistance" for at least one of the 5 activities of the study. In this analysis, we focus on severe activity restrictions in order to concentrate on population showing high risk of dependence on someone's help. Functional limitations were coded "yes/no" considering people reporting "some or many difficulties" or "need for help" to one of the 8 items. By collating some items, we obtain the proportion of limitations of different nature (Box 1) : sensory (sight), cognitive (orientation in time) and physical (suppleness and handling), locomotion and balance). The target population is divided into 7 exclusive categories of functional limitations in order to take into account the combinations of several types of limitations: physical only, sensory only, cognitive only and the different possible combinations.

b. Study Population and demographic characteristics under consideration

This study aiming at exploring the relations between functional limitations and activity restrictions, it is necessary to consider a population old enough in order to obtain a fair number of people affected by these problems inasmuch as activity restrictions in personal care affect few people under the age of 70 (Cambois *et al.,* 2003b). However, in order to bring to the fore possible differences between "old" and "young" age groups in the disablement process, we have worked with a study population aged 55 and over. This population is comprised of 6 204 men and 10 757 women representing a total

population of 14 756 876 people (weighted data). In the study population, 63 % of the questionnaires were completed by the individuals themselves, 17 % of the respondents were assisted and 20 % were replaced by a family member who answered on the senior's behalf; in institutions, only 36 % of the questionnaires were completed by the people themselves. The average age is 70.2 for women and 67.8 for men with weighted numbers. Important differences in the prevalence of disability in the populations living at home and living in institutions can be noticed (Mormiche *et al.,* 2000 ; Cambois *et al*., 2003b) : institutionalization is often conditioned by an altered functional status which are difficult to manage at home (Mormiche *et al*., 1999). Besides, with similar disabilities, men and women have different probabilities to go into institutions (Cambois et al., 2003a). So it seems interesting, in this analysis, to take into account the differences related to the place of residence, in addition to the variables of age and sex.

RESULTS

1. Functional limitations and severe restrictions concerning personal care activities.

According to the HID survey, out of 14,75 millions of people aged 55 and over , 50 % (7,38 millions) present one or several functional problems : locomotion and balance, suppleness and handling, sight, orientation in time whereas 11 % present severe restrictions to feed themselves, wash, dress or go to the toilets, get in and out of bed (table 1).

Table 1: Prevalence of severe activity restriction for personal care and of functional limitation* for men and women aged 55 and over, in general population (and estimated confidence intervals[1]).

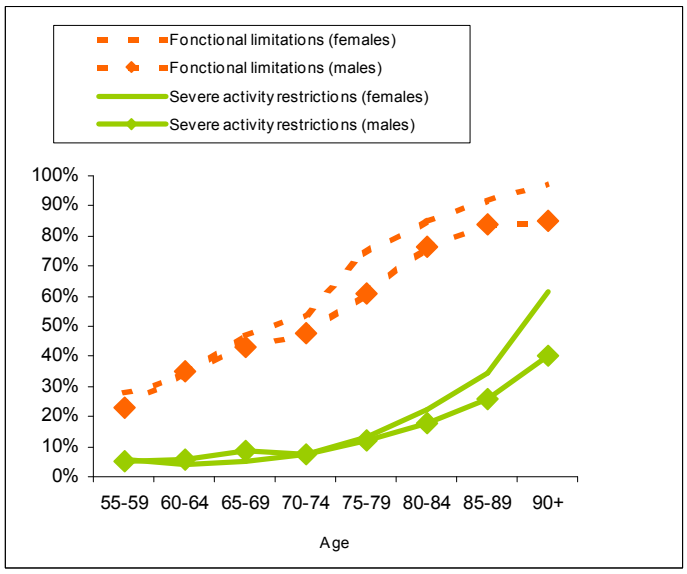
	Women		Men		All
One limitation	54,5%	(53,8-55,2)	44,1%	(43,1-45,2)	50%
One severe restriction	11,8%	(10,9-12,7)	9,2%	*(8,3-10,1)*	11%

* Severe activity restriction (personal care) and functional limitations (seeing, walking up and down the stairs…) (See Box 1)
Data source: HID Survey« institutions », 1998 and « households » 1999

If on average women report more severe activity restrictions for personal care than men, the difference only appears clearly after 70 (Figure 1). Before this age, differences are not statistically significant, suggesting to describe separately the situation of the younger (55-70) and of the older (70 and over). Prevalence of severe activity restrictions distinctly increase after 70 and affect about 40 % of men and 61 % of women aged 90 and over. Progressing on an almost linear way with age, functional problems affect about one of four people among the 55-59 and 85 % of men and 98 % of women over 90; women tend to report functional limitations more frequently than men at almost all ages.

[1] Because of institutions over-representation in HID, confidence intervals were calculated by combining prevalence in households and institutions, unweighted population from "households" and "institutions" surveys and the part represented by both groups among general population; they don't take into account the sampling stratification which helped in over represent other categories. This applies to every tables.

Figure 1: Prevalence of severe activity restriction for personal care and of functional limitation* by age groups for men and women aged 55 and over in general population.



* Severe activity restriction (personal care) and functional limitations (seeing, walking up and down the stairs…) (Box 1)
Sources: HID Survey« institutions », 1998 and « households » 1999

Women, who report more functional problems than men, are more prone to undergo concurrently several types of limitations than them. With similar age structure, the combination of all types of limitations represents 8 % of the female functional limitations and 4 % of the males' one (Table 2). Women also report more often the cognitive problem (orientation in time), representing about 16 % of their functional problems against 10 % of men's; one can notice that cognitive problems seldom occur without related functional problems.

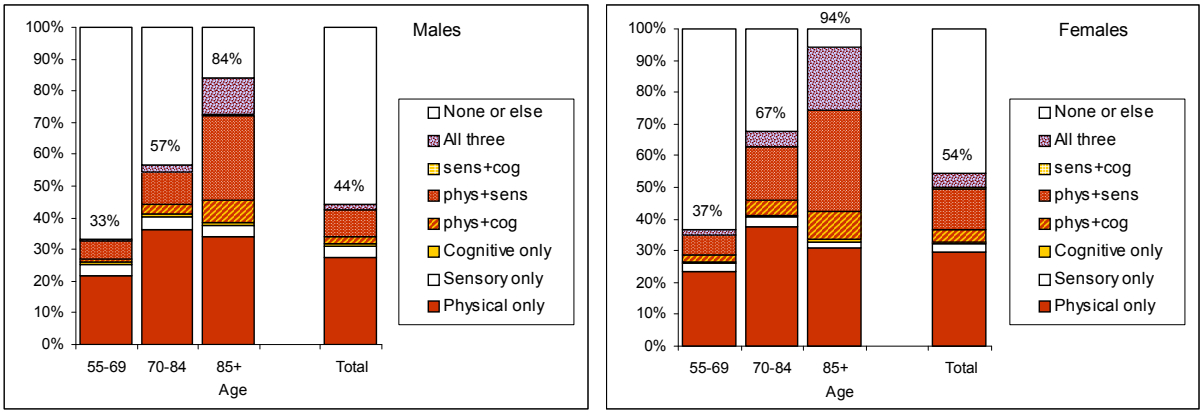
Table 2: Distribution of functional limitations * for men and women aged 55 and over, according to their physical, sensory or cognitive nature (%)

Functional limitation:	Men**	Women
Physical only	63	54
Physical and sensory	18	24
Sensory only	8	5
Physical, Sensory, cognitive	4	8
Physical and cognitive	4	7
Cognitive only	2	1
Sensory, and cognitive	≅ 0	≅ 0
All limitations	100	100

* Functional limitations (seeing, walking up and down the stairs...) (see Box 1)
** For men, figures standardized according to the age structure of the female population
Sources: HID Surveys « institutions », 1998 and « households » 1999

Profiles of functional problems also change with age and the risks of combining several kinds of limitations and reporting the cognitive problem considerably increase: over 85, 84 % of men and 94 % of women report one functional limitation (physical, orientation in time, sight), about 4 people out of 10 combine two functional limitations and 2 out of 10 combine the three types of limitations (Figure 3).

Figure 3: Distribution of the population according to exclusive categories of functional limitations * by sex and age groups.



* Functional limitations (seeing, walking up and down the stairs…) (See Box 1)
Sources: HID Survey« institutions », 1998 and « households » 1999

2. From functional limitations to activity restrictions

The risk of experiencing severe difficulties to perform daily personal care is conditioned by the presence of functional limitations ; this risk is nearly nil among people presenting none of the limitations envisaged in the present study and reaches 21 % among people reporting at least one limitation (Table 3). Thus, this also means that eight people out of ten presenting functional limitations manage to perform personal care activities on their own. But this rate varies along with age, sex or place of residence, showing differences in the chances of managing daily activities for people with functional problems: only four out of ten over 90 years old or 3 out of 10 among institutions residents are free of severe activity restrictions. (Table3).

Table 3: Probabilities to experience a severe restriction for personal care activities along with one of the study's functional limitations according to age, sex and place of residence (households or institutions).

	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Total
General Population									
Men	22	16	20	16	20	23	31	48	**21**
Women	19	12	11	14	18	26	37	63	**22**
All	20	14	15	15	19	25	35	60	**21**
Standard households									
Men	21	15	19	14	18	20	26	41	**19**
Women	19	11	10	12	16	21	29	56	**18**
All	20	13	14	13	17	21	28	53	**18**
Institutions									
Men	52	51	59	68	61	70	69	68	**65**
Women	44	49	52	59	66	65	71	77	**69**
All	49	50	56	63	64	66	70	75	**68**

* Severe activity restriction (personal care) and functional limitations (seeing, walking up and down the stairs) (See Box 1)
Sources : HID Survey« institutions », 1998 and « households » 1999

The gender differences in functional limitation types of problems reflect specific situations of disability linked firstly to the very nature of such limitations; as noticed earlier, men and women are not evenly concerned by functional problems. The different nature of functional problems are not evenly linked to activity restrictions, depending for instance to the possibility of compensating their effect with assistive devices. But the differences shown in table 3 can also be the result of disparities within population in the risks that a specific functional problems lead to restriction due to different way to cop with it. Logistic regressions have allowed to study these two possible explanations by

evaluating to which extent gender differences in the risk of facing severe restrictions can be ascribed to the type of functional problems they encounter, and to which extent such differences persist when the nature of the functional problems is taken into account.

First, models show the role of the nature of the functional limitations different on the risk of facing severe activity restrictions for personal care. People aged 55 and over, presenting only problems of sight, have no higher significant risk of activity restriction than those who report no functional problems, controlling effects of sex, age and place of residence. Problems solely cognitive, relatively rare, only have a significant impact beyond 70 (table 4); the combination of these two types of limitations is nearly non-existent and seems to have an impact only before 70. It is definitely the presence of a physical problem that more strongly increases this risk of restriction, which is even stronger since the physical problem comes concurrently with cognitive and sight limitations (table 4). Among physical limitations, the probability to have severe activity restriction for personal care is more important in the case of suppleness and handling problems (use one's hands, cut one's toenails) than in the case of locomotion and balance problems (lean over and pick an object, move around, walk up the stairs…) (figures not supplied here). Although the seriousness of limitations is not shown here, it has been checked by considering only severe functional limitation (excluding those reporting only some difficulties –box 1) that results are similar; even with serious functional problems, disparities in the risk of severe activity restrictions exist depending on these demographic characteristics.

Beside this expected effect of functional profiles, regressions also shed light on a specific effect of sex. Women report on average more functional limitations, and in greater share the limitation which are the most strongly linked to restrictions than men; but surprisingly, women are at minor risk than men of reporting a severe restriction facing similar functional limitations, when age and the place of residence are taken into account (table 4). However, this tendency decreases with age, women's advantage being at the limit of the significant difference for people aged 70 and over (the difference is no longer significant over 80 – figures not supplied-).

Tableau 4: Odd Ratios of the risk of experiencing a severe activity restriction according to age, sex, place of residence and functional state (exclusive categories of limitations) Men and Women, 55 and over

Odd Ratio (severe restriction)	55-69		70 and over		55 and over	
Sensory only (vs none or other)	*1,83*	*[0,39-8,60]*	*1,79*	*[0,38-8,51]*	*1,79*	*[0,60-5,37]*
Cognitive only	*1,62*	*[0,20-13,1]*	14,3	[5,15-39,7]	7,65	[3,32-17,6]
Sensory +cognitive	20,9	[2,15-203]	*7,52*	*[0,87-65,1]*	9,83	[2,09-46,3]
Physical only	42,6	[21,9-83,0]	64,9	[32,2-131]	52,2	[32,3-84,6]
Physical +sensory	66,3	[33,6-131]	100	[49,8-203]	80,4	[49,5-131]
Physical + cognitive	112	[55,8-226]	286	[141-580]	204	[125-333]
3 types	177	[86,9-359]	526	[259-1067]	379	[232-620]
One additional year of age	*1,01*	*[0,99-1,03]*	1,03	[1,03-1,04]	1,02	[1,02-1,03]
Institutions (vs standard households)	3,54	[2,96-4,23]	3,72	[3,36-4,12]	3,77	[3,45-4,11]
Women (vs men)	0,75	[0,64-0,89]	*0,90*	*[0,81-1,00]*	0,86	[0,79-0,94]

Severe activity restriction (personal care) and functional limitations (seeing, walking up and down the stairs) (See Box 1)
Sources: HID Survey« institutions », 1998 and « households » 1999

3. Compensatory strategies and resort to assistive devices or human assistance

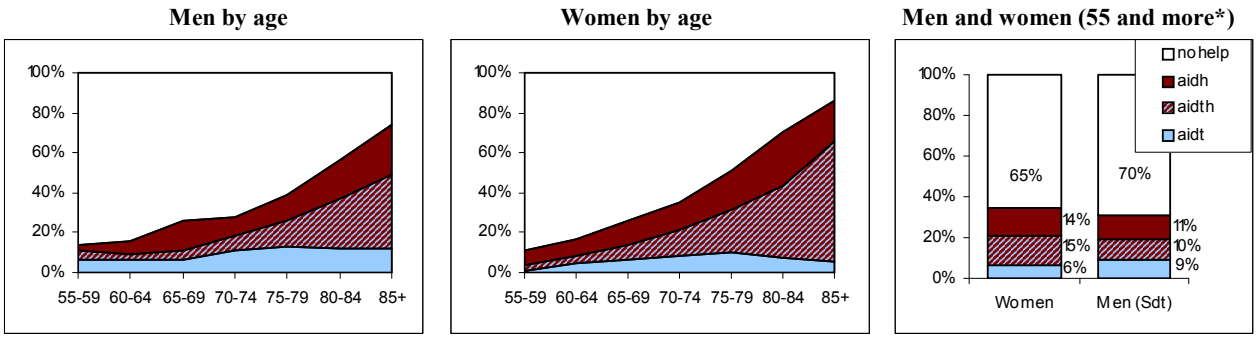
Besides factors that may prevent any possible efficient compensation, one assumes the monitoring of these functional limitations is differentiated according to age or sex or organization in the place of residence. Indeed, it appears that for people facing functional problems, resorting to equipment seems to considerably reduce activity restrictions, whatever the seriousness of those problems (Verbrugge et al., 1997) ; this study underlines the equipment's greatest efficiency compared to human support in order to reduce the declared activity restrictions, with equal functional problems (same type and same seriousness), suggesting that people using technical assistance manage to compensate by themselves their functional problems and report more frequently being independent for daily life activities.

This differentiated resort, the resulting feeling of independence and the way of reporting functional problems explain some differences outlined in this study. For example, between the youngest and the oldest in this study: the origin and acceptance of functional limitations are not comparable at different ages of life, and neither are the mobilized resources (individual or collective) to compensate them and adjust to its consequences (rehabilitation, bracing…); for instance in front of locomotion difficulties due to accident in younger ages and osteoarticular troubles in older ages, mobilization in individual resources, use of rehabilitation programs and resort to adapted devices may differ. An other example with institutions, the assistance provided by staff for dressing and toileting to resident, could reinforce the feeling they need assistance and can therefore explaining the more systematic report of severe restrictions compared to households, controlling for sex, age and functional problems. Finally, such an aspect could also explain the advantage of women before age 70 in the risk of severe activity restriction: a study showed that men resort to technical assistance more than women and the latter resort more often to assistance provided by a third party (Ravaud et al., 2003), using a more independent monitoring of their functional problems; men might under-report compensated functional problems, quoting only those they could cop with and which have a more systematically linked with severe activity restrictions; moreover the questions' wording which encourages people not to report compensated problems would reinforce this effect.

The data used in this study can be analyzed on this perspective for people living in private households. It was possible to examine who report using technical assistance (sticks, brace, house equipment, devices to read…) and/or human assistance to constitute four groups: no help used, use of technical devices only, human assistance only and use both technical devices and human assistance. This information is collected independently from the set of questions on disability. We analyzed the distribution of the population according to the type of help use to compare men and women situation, according to age and functional problems. Then we looked at the relationship between the type of help used and the risk of severe activity restriction.

Figure 5 shows that in general men aged 55 years and older more often use no help or technical devices only. Women is more incline to use human assistance with or without devices, at any age.

Figure 5: Resort to assistive devices, human assistance or both by sex and age.
Men and women aged 55 years and older



** Standardized for men on the female population's age structure*

Women have more functional problems than men; the resort to aids partly illustrates this excess of functional difficulties. Indeed, the Figure 6 shows the different resort that is made by men and women according to the type of functional problems they report. On the overall, whatever the functional problems, men still are more incline to use technical devices but the amount of aids vary considerably with the nature of the problems. While sensory and physical problems leave the room for technical devices as the most frequent resort, the cognitive problems goes along with a massive resort to human assistance. If we assume that using technical devices is an indicator of coping, this first result confirms what is suggested earlier about the impact of the nature of functional limitations on the possibilities to cop.

Figure 6 also shows that among the 50 % of people who do not report any limitation, there are still some who report using assistance: while the risk of activity restriction is close to zero for those who do not report functional problems, this could mean that some functional limitations are not reported due to the fact that they are compensated; this misreport of functional problems might be explained either because of the formulation of the questions as some of them suggested to report only the limitations that are not compensated or because people omit by themselves to report compensated limitations. On the opposite, Figure 6 shows that those who report the three types of problems simultaneously almost all benefit an assistance, mainly from someone: it is noticeable that in this case men still use more technical devices and more women do not report any type of assistance despite the apparent severity of their problems. It could be interpreted as less severe problems reported by women than men.

Figure 6: Resort to assistive devices, human assistance or both by sex and according to the reported functional problems. Men and women aged 55 years and older (age standardised data for men)

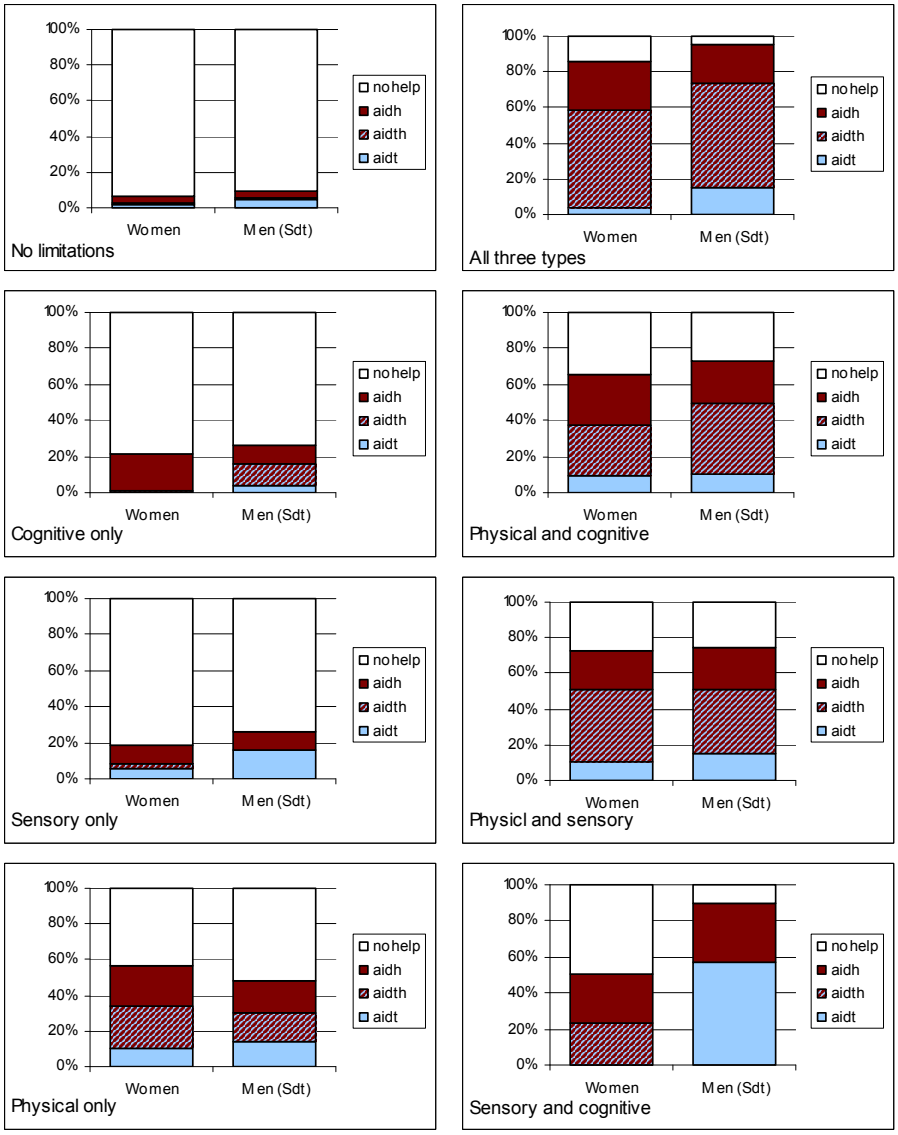


Table 5 shows the results of a logistic regression for gender differences in the use of aids, controlling for age and then controlling for age and functional limitations. It confirms that women use more aids on the overall but when controlling for functional status, it seems that men use more technical devices and women more human assistance.

Table 5: Odd ratios for the use of different type of aids (women vs men)

Use of aids (controlling for age)		
• Using technical devices (with or without human assistance)	1,16	[1,07 -1,27]
• Using human assistance (with or without technical device)	1,76	[1,62 -1,92]
• Using technical devices only	*0,89*	*[0,78 -1,01]*

Use of aids (controlling for age and functional status)		
• Using technical devices (with or without human assistance)	*0,94*	*[0,85 -1,03]*
• Using human assistance (with or without technical device)	1,50	[1,36 -1,65]
• Using technical devices only	0,76	[0,67 -0,88]

Any type of help used increases the risk of being severely restricted in personal care activities compared to not using any help (Table 6); but technical devices only is correlated with a lower risk of severe restriction than human assistance or both technical and human assistance, even when controlling for functional status. Controlling for the type of help used ascertains the advantage of women over men in the risk of activity restriction everything else being equal.

Table 6: Odd ratios for the risk of reporting severe activity restriction according to sex and type of aids used

Risk of severe activity restrictions (controlling for age)		
Use of technical devices only (vs no help)	4,85	[3,02 -7,79]
Use of human assistance only	17,9	[12,2 -26,2]
Use of both technical devices and human assistance	65,6	[45,4 -94,8]
Women (vs Men)	0,76	[0,65 -0,90]
Risk of severe activity restrictions (controlling for age and functional status)		
Use of technical devices only (vs no help)	2,73	[1,69 -4,41]
Use of human assistance only	8,84	[5,98 -13,1]
Use of both technical devices and human assistance	28,3	[19,5 -41,2]
Women (vs Men)	0,70	[0,59 -0,83]

Finally and in the other way round, we looked at the determinants of using the different types of aids to check if it can provide evidence of different practices or if it only represents more or less severe functional status. In the field of accommodation, it appears more evident to compensate physical or sensory problems than cognitive troubles. Therefore in the following analysis, we focused on people reporting physical problems with or without additional visual limitations to estimate odd ratio for using no help, using technical devices only, human assistance only or both type of aids : explicative variables are age, sex, severity of the limitations and being restricted or not (Table 7).

In case of physical problems (isolated or with a visual problems), both for men and women, using no help is more frequent for younger people, moderate limitations and concerns more frequently people who report being independent in their personal care activities. The resort to technical devices only is not dependent on the severity of the limitation and the age is not determinant for men. But it is worth noting that using technical devices only, when controlling for all the other variables, is more frequent for people who are not restricted : this finding shows that even though the use of technical devices is correlated with activity restriction, being linked to functional problems, the use of technical equipment for people with physical and sensory problems goes along with independence more than with activity restrictions. Meanwhile, using human assistance only is more frequent when limitation are severe. For women, it goes along with independence while it is not significantly different for men who are restricted and for men who are independent, when controlling for the other variables. Finally, using both technical aids and human assistance is strongly linked to severe activity restrictions and severe levels of limitations and is also positively related to age. There are gender differences in the way to cop with functional problems but the impact of the various type of help on the risks of restrictions is also changing with sex.

Table 7: Odd ration for using aids among people with physical limitation controlling for sex, age severity of the limitation and activity restriction status

	Men		Women	
Odd ratio for using no help at all				
One additional year of age	0,97	[0,96 -0,98]	0,96	[0,95 -0,97]
Severe functional limitation (vs not severe)	0,28	[0,23 -0,34]	0,25	[0,21 -0,29]
Being independent (vs restricted)	11,1	[6,89 -18,0]	7,20	[4,87 -10,6]
Odd ratio for using technical devices only				
One additional year of age	*1,00*	*[0,99 -1,01]*	0,98	[0,97 -0,99]
Severe functional limitation (vs not severe)	*0,97*	*[0,77 -1,22]*	*1,16*	*[0,92 -1,45]*
Being independent (vs restricted)	3,30	[2,23 -4,88]	3,17	[2,18 -4,62]
Odd ratio for using human assistance only				
One additional year of age	*1,00*	*[0,98 -1,01]*	*0,99*	*[0,98 -1,00]*
Severe functional limitation (vs not severe)	1,69	[1,32 -2,17]	1,30	[1,08 -1,56]
Being independent (vs restricted)	*0,81*	*[0,62 -1,07]*	1,33	[1,07 -1,64]
Odd ratio for using both human assistance and technical devices				
One additional year of age	1,04	[1,02 -1,05]	1,05	[1,05 -1,06]
Severe functional limitation (vs not severe)	5,34	[4,02 -7,11]	4,64	[3,74 -5,75]
Being independent (vs restricted)	0,19	[0,15 -0,24]	0,23	[0,19 -0,28]

DISCUSSION

Most of the people experiencing activity restrictions also have functional limitations. However, every functional limitation does not lead to activity restriction; the extent of the risk of suffering an activity restriction when having a functional limitation varies according to age groups, sex. So the assumption of a process in which functional limitations would constitute a predictive but non-systematical stage of activity restriction is somehow ascertained by these results, even if the cross-sectional nature of this study still does not allow to validate any dynamic relationship. As a first step, our study confirms the strong relation between physical limitations and activity restrictions already demonstrated by previous research (Wolinsky *et al.*, 1991, Lawrence *et al.*, 1996 ; Manton *et al.*, 1998); it further underlines the specific role of suppleness and handling problems within physical limitations. Cognitive problems, as developed in this study, are also highly correlated with the presence of an activity restriction among elderly people, as previous work demonstrate (Steen *et al*., 2001 ; Freedman *et al*., 2001); our study also indicates that such limitations are seldom isolated meaning that the risks usually attributed to cognitive problems in some study is rather due to the concurrent presence of other types of limitations. It seems very important to take into account the plurality of difficulties not only to better understand the risks of dependence associated with functional problems but also to be aware of the heterogeneity in the needs of people reporting one type of functional problems depending on these concurrent problems.

If the situations of plural limitations clearly appear in this study it is noteworthy that the survey only assesses a selection of functional limitations, many of other being omitted. But also, existing questions were eliminated when bringing redundant information (ex: “maximum walking distance” for mobility) or when they were complex and mixed various fields we wished to distinguish (*carry* a

bag of a given weight and *walk for* a given distance"). Questions correlated to auditory problems were also eliminated once their very low impact on the probability to create severe restrictions in personal care activities was verified. When taken into account auditory problems, men who are particularly concerned report more overall functional limitations and the risk of severe restriction in presence of limitation decreases; it does not impact on the nature of the presented outcomes. However, other limitations likely to explain a restriction in daily elementary activities (cognitive nature for instance) may be absent. Therefore, the instruments used do not reflect each type of limitation in an exhaustive and optimal way, particularly regarding cognitive problems. But insofar as 99 % of severe restriction cases are related to one of the study's limitations, one can conclude that the possible omitted limitations, when isolated, have a weak impact on restriction (as for auditory problem for instance), except if associated to the limitations considered. In that case, the bias linked to the omitted limitations would come down to an over-estimation of the impact attributed to functional limitations studied here as it would also be partly due to these missing limitations.

Moreover in that line of thinking, our functional limitations indicators are not "pure" in the sense that what we classify as "physical limitations" may also be the result of sensory or cognitive impairments; difficulties in walking up and down the stairs classified here in the mobility field, may be due to visual impairments. This limit especially affects physical problems: sight and orientation in time problems are undoubtedly less subjected to that bias. Therefore, this study probably under-estimates the share and the impact of sensory or cognitive impairment, on the risk of experiencing an activity restriction, by assimilating them to the physical problems they bring about; therefore the study could over-estimate the physical problems' role in the process. However, from this perspective, using exclusive limitations categories contribute to limit this bias in interpretation: for instance, if the physical difficulty was due to blindness, the individual would also claim a visual limitation. This study proves that even isolated physical limitations have a true and very important influence on the risk of having a restriction. It is also noticeable that the restriction risk associated to cognitive problems is strong and that even if it is under-estimated in the present study, it is at least largely represented.

More problematic is the wording of the questions in the survey, some asking people to mention only the difficulties not compensated by the most common tools (glasses, stick, …); it prevents us to consider, as we expected to do, people with intrinsic functional problems among which some compensate and some don't. Independence granted daily by assistive devices may induce people to under-report functional problems (Verbrugge et al., 1997). In the very case of our study, it seems possible that more visual and locomotion problems, for which common devices exist, would have been reported; it would have contributed to increase the prevalence of limitations and decrease the probability of suffering severe activity restrictions in presence of stated limitations. This latter limits should less intervene for cognitive problems for which compensatory strategies are not as straightforward as it can be for some sight or physical problems; they might more frequently require supervision than actual intervention to do things for of the person. This limit in the data may have a consequence on the differences observed between the population groups considered here and explain

for instance the minor risk women before 70 run compared to men's if men under-report compensated problems while they are more incline to resort technical assistance than women. This limits tends moreover to affect the analysis of the use of aids: the data could over-estimate the use of technical devices for men who do not report the physical or sensory limitation for which they are reporting separately using the aids. In the other hand, men may under-report human assistance brought by their spouse if they do not acknowledge it as an assistance; it is certainly less the case for women who are more frequently alone when they need help.

Therefore, although these figures indicate that women in younger ages better cop with their problems than men when using someone's help, they could also indicate that men, more incline to use technical devices as compensatory strategies, omit to report the least restrictive of their functional problems. Women may use human assistance "earlier" than men in the process leading from functional problems to activity restriction, although they could still compensate them by themselves, using technical devices. But in the other hand, the use of human assistance could be preferred by women to cop with light problems and avoid more heavy consequences and be more efficient for them than the use of technical devices. Indeed, if human assistance is linked to a higher risk of being restricted, using human assistance for women is more frequent for those who are not restricted than for those who are, everything else being equal.

CONCLUSION

Despite the limits of the data, the *functional limitations* and *activity restrictions* approach allowed to raise dual disparities in the functional decline process: the exposure to different functional problems and the monitoring of such problems allowing or not to remain independent. As for the exposure stage, we show that some profiles of functional limitations create a risk of more severe restrictions (physical problems, combined cognitive problems); such profiles are more frequent among some population groups. Elderly women more often suffer from disabling diseases (mental and osteoarticular disorders…) than men (Sermet, 1998). But we demonstrate the persistent differences (or even reversed for men and women) in the risks of activity restrictions when one takes into account functional problems' profiles, suggesting disparities at the stage of monitoring functional problems.

The type of help used seems to be linked to the risk of reporting severe activity restriction even when type of limitation and severity is taken into account for people living in households. The use of technical devices seems to enlighten the burden of care for dependency while it prolongs people's autonomy to carry on their personal care activities. Despite women seems to be more protected than men when they use human assistance, the study shows that this type of help increases the risk of restriction compared to the use of technical devices. While the increasing proportion of the elderly in the population rises public health problems regarding care and assistance for dependent people, it may be useful to know more about the efficiency of the different types of help to prevents from restrictions and keep people active as long as possible, even with functional problems that old ages use to bring.

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