

Online Resource 4

Characteristics of included studies and patient-reported outcome measures, with references

Article title 'Patient-reported outcome measures for assessing breast sensation after mastectomy: Not fit for purpose'
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Author names Hansje P. Smeele; Rachel C. H. Dijkstra; Merel L. Kimman; René R. W. J. van der Hulst; Stefania M. H. Tuinder
Corresponding Author Stefania M. H. Tuinder. Department of Plastic, Reconstructive and Hand Surgery, GROW – School for Oncology and Developmental Biology, Maastricht University Medical Center; P.O. Box 5800, 6202 AZ, Maastricht, the Netherlands. s.tuinder@mumc.nl

Table 1 Characteristics of the included studies and patient-reported outcome measures

Study (n = 135)	Study design	Surgery type	N ^a	Sensation endpoint	Measure (n = 124)	Sensation items (n = 215)	Response options	Item content ^b
Abozeid <i>et al.</i> , 2018 ¹	Cross-sectional	Reduction mammoplasty/mastopexy	25	Secondary	<i>Ad hoc</i> ¹	"Satisfaction with nipple sensation after the operation"	highly satisfied/satisfied/not satisfied	1- nipple 2- sensation 3- satisf/import
Ahmed <i>et al.</i> , 2000 ²	Cross-sectional	Reduction mammoplasty/mastopexy	38	Primary	<i>Ad hoc</i> ²	"How is your nipple sensation in comparison to prior to surgery?"	same/better/worse	1- nipple 2- sensation 3- comparative
Araco <i>et al.</i> , 2011 ³	Cross-sectional	Augmentation mammoplasty	1222	Primary	<i>Ad hoc</i> ³	"Postoperative degree of residual sensitivity compared to the pre-operative sensitivity"	complete loss/reduced sensitivity/normal sensitivity	1- breast 2- sensation 3- comparative
Banbury <i>et al.</i> , 2004 ⁴	Prospective cohort	Augmentation mammoplasty	47	Primary	<i>Ad hoc</i> ⁴	"How did the surgery affect your nipple sensation?"	increased/no change/decreased	1- nipple 2- sensation 3- comparative
Baron <i>et al.</i> , 2000 ⁵	Cross-sectional	Breast-conserving surgery/skin-sparing mastectomy + (expander-)implant-based reconstruction	132	Secondary	Breast Sensation Assessment Scale (BSAS), subscale: discomfort, validated ⁵	<ol style="list-style-type: none"> "How often do you experience numbness in your breast?" "How severe is the numbness you experience in your breast?" "What level of distress causes the numbness you experience in the breast?" 	<ol style="list-style-type: none"> 4-point Likert scale from "rarely" to "almost constantly" 4-point Likert scale from "slight" to "very severe" 5-point Likert scale from "not at all" to "very much" 	<ol style="list-style-type: none"> 1- breast 2- numbness 3- absolute 1- breast 2- numbness 3- satisf/import 1- breast 2- numbness 3- impact

Table 1 (continued)

Study (n = 135)	Study design	Surgery type	N ^a	Sensation endpoint	Measure (n = 124)	Sensation items (n = 215)	Response options	Item content ^b
Baumeister <i>et al.</i> , 1986 ⁶	Cross-sectional	Reduction mammoplasty/mastopexy	162	Secondary	<i>Ad hoc</i> ⁶	"Sensation of the nipple"	diminished/unchanged	1- nipple 2- sensation 3- comparative
Berg <i>et al.</i> , 1995 ⁷	Cross-sectional	Reduction mammoplasty/mastopexy	163	Secondary	<i>Ad hoc</i> ⁷	"Nipple-areola complex sensation"	decreased/not affected	1- nipple 2- sensation 3- comparative
Blomqvist <i>et al.</i> , 1999 ⁸	Cross-sectional	Mastectomy + reconstruction with autologous flap	152	Secondary	<i>Ad hoc</i> ⁸	"Sensitivity to touch in the reconstructed breast in comparison with the contralateral breast"	reduced/equal/increased	1- breast 2- touch 3- comparative
Blondeel <i>et al.</i> , 1999 ⁹	Cross-sectional	Skin-sparing mastectomy + reconstruction with (innervated) autologous flap	121	Primary	<i>Ad hoc</i> ⁹	1. "Do you have feeling in the reconstructed breast when touched?" 2. "Do you have erogenous sensation in the reconstructed breast?"	1. yes/no/alternating areas of sensation and numbness 2. yes/no	1. 1- breast 2- touch 3- absolute 2. 1- breast 2- erogenous 3- absolute
Bodin <i>et al.</i> , 2008 ¹⁰	Cross-sectional	Mastectomy + (expander-) implant-based reconstruction	256	Secondary	<i>Ad hoc</i> ¹⁰	"Satisfaction with sensitivity of the nipple"	4-point Likert scale from "very dissatisfied" to "very satisfied"	1- nipple 2- sensation 3- satisf/import
Brandberg <i>et al.</i> , 2012 ¹¹	Prospective cohort	Skin-sparing mastectomy + (expander-)implant-based reconstruction	91	Secondary	<i>Ad hoc</i> ¹¹	"How is your breast sensation?"	7-point Likert scale from "very bad" to "very good"	1- breast 2- sensation 3- absolute
Brennan <i>et al.</i> , 2007 ¹²	Cross-sectional	Augmentation mammoplasty	484	Secondary	<i>Ad hoc</i> ¹²	1. "Sensory disturbances" 2. "Percentage change from preoperative sensation"	1. a score of 0.5 was given to each breast, resulting in a range of -1.0 (bilateral hypoesthesia) to +1.0 (bilateral hypesthesia) and "0" being no change in sensation 2. %	1. 1- breast 2- sensation 3- absolute 2. 1- breast 2- sensation 3- comparative

Table 1 (continued)

Study (n = 135)	Study design	Surgery type	N ^a	Sensation endpoint	Survey (n = 124)	Sensation items (n = 215)	Response options	Item content ^b
Bresser <i>et al.</i> , 2006 ¹³	Cross-sectional	Skin-sparing mastectomy + (expander-)implant-based reconstruction	136	Secondary	<i>Ad hoc</i> ¹³	"Change in feeling of the breasts"	5-point Likert scale from "no!" to "yes!"	1- breast 2- sensation 3- comparative
Brown <i>et al.</i> , 2000 ¹⁴	Cross-sectional	Reduction mammoplasty/ mastopexy	74	Secondary	Unclear validation thus considered <i>ad hoc</i> ¹⁴	"Nipple sensation"	5-point Likert scale from "poor" to "excellent"	1- nipple 2- sensation 3- absolute
Cardenas-Camarena <i>et al.</i> , 2009 ¹⁵	Cross-sectional	Reduction mammoplasty/ mastopexy	356	Secondary	<i>Ad hoc</i> ¹⁵	"Alteration in nipple-areola complex sensitivity"	minimal/moderate/severe	1- nipple 2- sensation 3- comparative
Casaubon <i>et al.</i> , 2020 ¹⁶	Cross-sectional	Breast-conserving surgery/ nipple-sparing mastectomy + (expander-)implant-based reconstruction	600	Secondary	<i>Ad hoc</i> ¹⁶	"How pleasurable is it to have your treated/reconstructed breast caressed or stimulated, now?"	5-point Likert scale form "very unpleasant" to "very pleasurable"	1- breast 2- erogenous 3- absolute
Cerovac <i>et al.</i> , 2005 ¹⁷	Cross-sectional	Reduction mammoplasty/ mastopexy	90	Secondary	<i>Ad hoc</i> ¹⁸	"Nipple sensation"	unchanged/increased/diminished or lost	1- nipple 2- sensation 3- comparative
Chapman <i>et al.</i> , 2006 ¹⁸	Cross-sectional	Lactiferous duct excision	87	Secondary	<i>Ad hoc</i> ¹⁸	<ol style="list-style-type: none"> 1. "Did you experience postoperative sensory loss?" 2. "Did the loss of sensation improve with time?" 3. "Did sensory loss affect your quality of life?" 4. "Did you maintain erectile function of the nipple?" 	yes/no	<ol style="list-style-type: none"> 1. 1- breast 2- sensation 3- absolute 2. 1- breast 2- sensation 3- comparative 3. 1- breast 2- sensation 3- impact 4. 1- nipple 2- erection 3- absolute
Chen <i>et al.</i> , 1997 ¹⁹	Cross-sectional	Reduction mammoplasty/ mastopexy	36	Secondary	<i>Ad hoc</i> ¹⁹	"Nipple-areola complex sensitivity"	unchanged/increased/decreased	1- nipple 2- sensation 3- comparative
Cheng <i>et al.</i> , 2004 ²⁰	Cross-sectional	Skin-sparing mastectomy + reconstruction: 1. (expander-)implant	25	Secondary	<i>Ad hoc</i> ²⁰	"Sensation of the nipple-areola complex"	4-point Likert scale from "not pleased	1- nipple 2- sensation 3- satisf/import

Table 1 (continued)

Study (n = 135)	Study design	Surgery type	N ^a	Sensation endpoint	Survey (n = 124)	Sensation items (n = 215)	Response options	Item content ^b
		2. autologous flap 3. latissimus dorsi flap + implant					at all" to "very pleased"	
Chiari <i>et al.</i> , 2012 ²¹	Prospective cohort	Reduction mammoplasty/ mastopexy	64	Primary	<i>Ad hoc</i> ²¹	1. "Intensity of nipple-areola complex sensitivity" 2. "Quality of nipple-areola complex sensitivity"	1. same as before/ less than before/ more than before 2. same as before/ more pleasant than before/less pleasant than before/ "different"	1. 1- nipple 2- sensation 3- comparative 2. 1- nipple 2- erogenous 3- comparative
Cho <i>et al.</i> , 2008 ²²	Cross- sectional	Reduction mammoplasty/ mastopexy	41	Secondary	<i>Ad hoc</i> ²²	"Sensation of the nipple-areola complex"	4-point Likert scale from "bad" to "excellent"	1- nipple 2- sensation 3- absolute
Coelho de Almeida <i>et al.</i> , 2004 ²³	Cross- sectional	Reduction mammoplasty/ mastopexy	>500	Secondary	<i>Ad hoc</i> ²³	"Nipple sensation"	normal sensation/ sensation present but abnormal/no sensation	1- nipple 2- sensation 3- absolute
Cornelissen <i>et al.</i> , 2018 ²⁴	Cross- sectional	Skin-sparing mastectomy + reconstruction with (innervated) autologous flap	32	Secondary	<i>Ad hoc</i> ²⁴	1. "Do you have sensation in your reconstructed breast(s)?" 2. "Does the sensation in your reconstructed breast resemble the sensation of your healthy breast before operation?" 3. "Do you find it important that your reconstructed breast has sensation?" 4. "How important is the return of sensation in your reconstructed breast for your overall satisfaction with the result of the operation?"	1. 5-point Likert scale from "very much" to "very little" 2. 5-point Likert scale from "the same" to "totally different" 3. + 4. 5-point Likert scale from "not important" to "very important"	1. 1- breast 2- sensation 3- absolute 2. 1- breast 2- sensation 3- comparative 3. 1- breast 2- sensation 3- satisf/import 4. 1- breast 2- sensation 3- satisf/import
Cruz-Korchin <i>et al.</i> , 2003 ²⁵	Randomized controlled trial	Reduction mammoplasty/ mastopexy	208	Secondary	<i>Ad hoc</i> ²⁵	"Indicate the extent to which you were satisfied with sensation over the nipple-areola area of the breast after surgery"	10-point VAS from "very disappointed" to "very pleased"	1- nipple 2- sensation 3- satisf/import

Table 1 (continued)

Study (n = 135)	Study design	Surgery type	N ^a	Sensation endpoint	Survey (n = 124)	Sensation items (n = 215)	Response options	Item content ^b
Cruz-Korchin <i>et al.</i> , 2004 ²⁶	Cross-sectional	Reduction mammoplasty/ mastopexy	58	Secondary	<i>Ad hoc</i> ²⁶⁻²⁸	"Do you have absent nipple sensation after surgery?"	yes/no	1- nipple 2- sensation 3- absolute
Cruz <i>et al.</i> , 2007 ²⁷	Cross-sectional	Reduction mammoplasty/ mastopexy	164	Secondary				
Cruz <i>et al.</i> , 2010 ²⁸	Cross-sectional	Augmentation mammoplasty	105	Secondary				
Dahlbäck <i>et al.</i> , 2016 ²⁹	Prospective cohort	Breast-conserving surgery	297	Secondary	Unclear validation thus considered <i>ad hoc</i> ²⁹	"How satisfied are you with skin sensitivity in the breast?"	5-point Likert scale from "dissatisfied" to "very satisfied"	1- breast 2- sensation 3- satisf/import
Damen <i>et al.</i> , 2010 ³⁰	Cross-sectional	Skin-sparing mastectomy + reconstruction with autologous flap	70	Secondary	<i>Ad hoc</i> ³⁰	"Did the operation change the feeling in your breast(s)?"	5-point Likert scale from "no!" to "yes!"	1- breast 2- sensation 3- absolute
De Vita <i>et al.</i> , 2014 ³¹	Cross-sectional	Skin-sparing mastectomy + (expander-)implant-based reconstruction	15	Secondary	<i>Ad hoc</i> ³¹	"Sensitivity of the nipple-areola complex"	10-point VAS	1- nipple 2- sensation 3- absolute
Delay <i>et al.</i> , 2000 ³²	Cross-sectional	Skin-sparing mastectomy + reconstruction with autologous flap	50	Primary	<i>Ad hoc</i> ³²	<ol style="list-style-type: none"> 1. "How would you rate the sensitivity of your reconstructed breast?" 2. "How would you compare the sensitivity of your reconstructed breast with that of the other breast?" 3. "Which segment of your reconstructed breast is the most sensitive?" 4. "How would you rate the erogenous sensation of your reconstructed breast?" 5. "How important is return of feeling in your reconstructed breast to your overall satisfaction, besides the aesthetic result?" 	<ol style="list-style-type: none"> 1. very fine/ fine/poor/none 2. much less/less/ equal to/greater 3. see diagram: 1/2/3/4/5/6/7 4. very much/ some/little/none 5. very important/ important/not very important/ unimportant 	<ol style="list-style-type: none"> 1. 1- breast 2- sensation 3- absolute 2. 1- breast 2- sensation 3- comparative 3. 1- breast 2- sensation 3- absolute 4. 1- breast 2- erogenous 3- absolute 5. 1- breast 2- sensation 3- satisf/import

Table 1 (continued)

Study (n = 135)	Study design	Surgery type	N ^a	Sensation endpoint	Survey (n = 124)	Sensation items (n = 215)	Response options	Item content ^b
Didier <i>et al.</i> , 2009 ³³	Cross-sectional	Skin-sparing mastectomy/ nipple-sparing mastectomy + (expander-)implant-based reconstruction + nipple reconstruction	453	Secondary	Satisfaction with plastic-surgery cosmetic results, validated ³³	<ol style="list-style-type: none"> 1. "Regarding the breast operated and reconstructed: have you been satisfied with your breast skin sensitivity?" 2. "Have you been satisfied with the skin sensitivity of your other breast (if remodeled)?" 3. "During the last four weeks, have you felt satisfied with your nipple sensitivity?" 	5-point Likert scale from "not at all" to "very much"	<ol style="list-style-type: none"> 1. 1- breast 2- sensation 3- satisf/import 2. 1- breast 2- sensation 3- satisf/import 3. 1- nipple 2- sensation 3- satisf/import
Dixon <i>et al.</i> , 1998 ³⁴	Cross-sectional	Lactiferous duct excision	110	Secondary	<i>Ad hoc</i> ³⁴	"Nipple sensitivity"	unchanged/ increased/ decreased/ absent or numb	<ol style="list-style-type: none"> 1- nipple 2- sensation 3- comparative
Djohan <i>et al.</i> , 2010 ³⁵	Cross-sectional	Nipple-sparing mastectomy + reconstruction: 1. (expander-)implant 2. autologous flap	141	Secondary	<i>Ad hoc</i> ³⁵	<ol style="list-style-type: none"> 1. "Nipple-areola complex sensation" 2. "Nipple-areola complex arousal" 	4-point Likert scale from "poor" to "excellent"	<ol style="list-style-type: none"> 1. 1- nipple 2- sensation 3- absolute 2. 1- nipple 2- erogenous 3- absolute
Dossett <i>et al.</i> , 2016 ³⁶	Prospective cohort	Skin-sparing mastectomy/ nipple-sparing mastectomy + reconstruction: 1. (expander-)implant 2. autologous flap	53	Secondary	Unclear validation thus considered <i>ad hoc</i> ³⁶	<ol style="list-style-type: none"> 1. "Satisfaction with sensation of your nipples in intimate or sexual activities" 2. "Satisfaction with sensation of your nipples in leisure or social activities" 3. "Satisfaction with sensation of your nipples in job-related situations" 4. "When my breast is stimulated, I become sexually aroused." 5. "When my nipple is stimulated, I become sexually aroused." 6. "How important is return of 	<ol style="list-style-type: none"> 1. - 3. 5-point Likert scale from "very dissatisfied" to "very satisfied" 4. + 5. 5-point Likert scale from "strongly disagree" to "strongly agree" 6. 4-point Likert scale from "unimportant" to "very important" 	<ol style="list-style-type: none"> 1. 1- nipple 2- erogenous 3- satisf/import 2. 1- nipple 2- sensation 3- satisf/import 3. 1- nipple 2- sensation 3- satisf/import 4. 1- breast 2- erogenous 3- absolute 5. 1- nipple 2- erogenous 3- absolute 6. 1- breast

Table 1 (continued)

Study (n = 135)	Study design	Surgery type	N ^a	Sensation endpoint	Survey (n = 124)	Sensation items (n = 215)	Response options	Item content ^b
						feeling in your reconstructed breast to your overall satisfaction, besides the aesthetic result?"		2- sensation 3- satisf/import
Edsander-Nord <i>et al.</i> , 1999 ³⁷	Cross-sectional	Mastectomy + reconstruction with autologous flap	26	Primary	<i>Ad hoc</i> ³⁷	1. "Touch sensibility in the reconstructed breast" 2. "Thermal sensibility in the reconstructed breast"	yes/no	1. 1- breast 2- touch 3- absolute 2. 1- breast 2- temperature 3- absolute
Edsander-Nord <i>et al.</i> , 2002 ³⁸	Prospective cohort	Mastectomy + breast reconstruction + nipple reconstruction	50	Primary	<i>Ad hoc</i> ³⁸	1. "Does the nipple become erect?" 2. "Does the nipple feel as it did before the procedure?"	yes/no	1. 1- nipple 2- erection 3- absolute 2. 1- nipple 2- sensation 3- comparative
Eggert <i>et al.</i> , 2009 ³⁹	Cross-sectional	Reduction mammoplasty/ mastopexy	57	Secondary	<i>Ad hoc</i> ³⁹	1. "Can you feel touch?" 2. "Can you feel heat/cold?" 3. "Is the sensitivity still improving?" 4. "Do you have sexual sensitivity?"	yes/no	1. 1- breast 2- touch 3- absolute 2. 1- breast 2- temperature 3- absolute 3. 1- breast 2- sensation 3- comparative 4. 1- breast 2- erogenous 3- absolute
Eichler <i>et al.</i> , 2013 ⁴⁰	Cross-sectional	Breast-conserving surgery	143	Secondary	<i>Ad hoc</i> ⁴⁰	"Has sensitivity changed in the nipple-areola complex?"	increased/ decreased	1- nipple 2- sensation 3- comparative
El-Ali <i>et al.</i> , 2009 ⁴¹	Cross-sectional	Mastectomy + reconstruction: 1. (expander-)implant 2. autologous flap	55	Secondary	<i>Ad hoc</i> ⁴¹	"Tactile sensation of the reconstructed nipple in comparison to the normal side"	10-point VAS	1- nipple 2- touch 3- comparative

Table 1 (continued)

Study (n = 135)	Study design	Surgery type	N ^a	Sensation endpoint	Survey (n = 124)	Sensation items (n = 215)	Response options	Item content ^b
		3. latissimus dorsi flap + implant + nipple reconstruction						
Evans <i>et al.</i> , 1994 ⁴²	Cross- sectional	Reduction mammoplasty/ mastopexy	16	Secondary	<i>Ad hoc</i> ⁴²	"Nipple sensation"	same/decreased/ increased	1- nipple 2- sensation 3- comparative
Gahm <i>et al.</i> , 2007 ⁴³	Cross- sectional	Skin-sparing mastectomy + (expander-)implant-based reconstruction	24	Primary		1. "Has your ability to feel sensation on the nipple changed after your breast surgery?" 2. "Has your ability to feel touch on the breast skin changed after your breast surgery?" 3. "Has your ability to feel cold on the breast skin changed after your breast surgery?"		1. 1- nipple 2- sensation 3- comparative 2. 1- breast 2- touch 3- comparative 3. 1- breast 2- temperature 3- comparative
Gahm <i>et al.</i> , 2013 ⁴⁴	Cross- sectional	Skin-sparing mastectomy + (expander-)implant-based reconstruction	46	Primary	<i>Ad hoc</i> ^{43,44}	4. "Has your ability to feel heat on the breast skin changed after your breast surgery?" 5. "Has your ability to feel pain in the breast skin changed after your breast surgery?" 6. "Has your ability to feel sexual sensations in the breast changed after your breast surgery?"	8-point Likert scale from "have no sensation" to "unchanged sensation"	4. 1- breast 2- temperature 3- comparative 5. 1- breast 2- pain 3- comparative 6. 1- breast 2- erogenous 3- comparative
Ghosh <i>et al.</i> , 1997 ⁴⁵	Cross- sectional	Mastectomy + reconstruction: 1. (expander-)implant 2. autologous flap 3. latissimus dorsi flap + implant + nipple reconstruction	22	Secondary	<i>Ad hoc</i> ⁴⁵	"Nipple sensation"	5-point Likert scale from "not pleased" to "very pleased"	1- nipple 2- sensation 3- satisf/import
Glaumann <i>et al.</i> , 1985 ⁴⁶	Cross- sectional	Skin-sparing mastectomy + reconstruction: 1. (expander-)implant 2. autologous flap	72	Secondary	<i>Ad hoc</i> ⁴⁶	1. "Perception of touch in the nipple-areola complex" 2. "Presence of erotic feeling in the nipple-areola complex"	normal sensitivity/ decreased sensitivity/no sensitivity/ hyperesthesia	1. 1- nipple 2- touch 3- absolute 2. 1- nipple 2- erogenous 3- absolute

Table 1 (continued)

Study (n = 135)	Study design	Surgery type	N ^a	Sensation endpoint	Survey (n = 124)	Sensation items (n = 215)	Response options	Item content ^b
Gullo <i>et al.</i> , 2011 ⁴⁷	Cross-sectional	Skin-sparing mastectomy + reconstruction: 1. (expander-)implant 2. autologous flap + nipple reconstruction	218	Secondary	<i>Ad hoc</i> ⁴⁷	"Sensation of the nipple"	10-point VAS	1- nipple 2- sensation 3- absolute
Hang-Fu <i>et al.</i> , 1991 ⁴⁸	Cross-sectional	Reduction mammoplasty/ mastopexy	410	Secondary	<i>Ad hoc</i> ⁴⁸	1. "Sensation loss of breasts" 2. "Sensation loss of nipple-areola"	yes/no	1. 1- breast 2- sensation 3- absolute 2. 1- nipple 2- sensation 3- absolute
Harcourt <i>et al.</i> , 2011 ⁴⁹	Cross-sectional	Mastectomy + breast reconstruction + nipple reconstruction	247	Secondary	<i>Ad hoc</i> ⁴⁹	"How satisfied are you with the sensation in your reconstructed nipple(s)?"	5-point Likert scale from "very dissatisfied" to "very satisfied"	1- nipple 2- sensation 3- satisf/import
Hart <i>et al.</i> , 2016 ⁵⁰	Cross-sectional	Skin-sparing mastectomy + reconstruction: 1. (expander-)implant 2. autologous flap	96	Secondary	<i>Ad hoc</i> ⁵⁰	1. "I am less able to feel sexual sensations in my breasts than before surgery." 2. "The loss of sensation in my breasts has negatively affected my sex life."	5-point Likert scale from "strongly disagree" to "strongly agree"	1. 1- breast 2- erogenous 3- comparative 2. 1- breast 2- erogenous 3- impact
Haslik <i>et al.</i> , 2015 ⁵¹	Cross-sectional	Skin-sparing mastectomy + reconstruction: 1. (expander-)implant 2. autologous flap + nipple reconstruction	36	Secondary	<i>Ad hoc</i> ⁵¹	"Satisfaction with the sensitivity of the nipple after nipple-sharing"	4-point Likert scale from "very dissatisfied" to "very satisfied"	1- nipple 2- sensation 3- satisf/import
Hau <i>et al.</i> , 2013 ⁵²	Randomized controlled trial	Breast-conserving surgery	688	Secondary	<i>Ad hoc</i> ⁵²	"Breast sensitivity"	4-point Likert scale from "poor" to "excellent"	1- breast 2- sensation 3- absolute
Hefter <i>et al.</i> , 2003 ⁵³	Cross-sectional	Reduction mammoplasty/ mastopexy	72	Secondary	<i>Ad hoc</i> ^{53,54}	1. "Change in sensitivity of areola-nipple" 2. "Postoperative erogenous function of the nipple-areola complex" 3. "How long did it take for nipple-areola complex sensation to return?"	1. + 2. improvement/ no change/mildly reduced sensation/ 50% decrease of sensation 3. ?	1. 1- nipple 2- sensation 3- comparative 2. 1- nipple 2- erogenous 3- comparative 3. 1- nipple 2- sensation
Hefter <i>et al.</i> , 2003 ⁵⁴	Cross-sectional	Reduction mammoplasty/ mastopexy	101	Primary				

Table 1 (continued)

Study (n = 135)	Study design	Surgery type	N ^a	Sensation endpoint	Survey (n = 124)	Sensation items (n = 215)	Response options	Item content ^b
								3- comparative
Heil <i>et al.</i> , 2011 ⁵⁵	Prospective cohort	Breast-conserving surgery	135	Secondary	Breast Cancer Treatment Outcomes Scale (BCTOS), subscale: breast specific pain, validated ⁵⁶ , ⁵⁷	"Please rate breast sensitivity on this four-point scale, according to your evaluation at this point in time. (Note: If you have had bilateral surgery, complete the items with regard to the difference between the right and left side.)"	4-point Likert scale from "no difference between treated and untreated breast and area" to "large difference between treated and untreated breast and area"	1- breast 2- sensation 3- comparative
Hetter <i>et al.</i> , 1979 ⁵⁸	Cross- sectional	Augmentation mammoplasty	221	Secondary	<i>Ad hoc</i> ⁵⁸	<ol style="list-style-type: none"> 1. "Did the operation affect your nipple sensation?" 2. "Is the change in nipple sensation bothersome to you?" 3. "Are there other areas of numbness?" 	yes/no	<ol style="list-style-type: none"> 1. 1- nipple 2- sensation 3- comparative 2. 1- nipple 2- sensation 3- satisf/import 3. 1- breast 2- numbness 3- absolute
Hintringer <i>et al.</i> , 1994 ⁵⁹	Cross- sectional	Reduction mammoplasty/ mastopexy	199	Secondary	<i>Ad hoc</i> ⁵⁹	"How is the sensitivity in the breast area after the operation?"	same/worse/ different/better	1- breast 2- sensation 3- comparative
Hyckel <i>et al.</i> , 2001 ⁶⁰	Cross- sectional	Reduction mammoplasty/ mastopexy	376	Secondary	<i>Ad hoc</i> ⁶⁰	"Postoperative sensibility of the nipple"	same/better/worse/ don't know	1- nipple 2- sensation 3- comparative
Hyza <i>et al.</i> , 2015 ⁶¹	Cross- sectional	Skin-sparing mastectomy + reconstruction with autologous flap + nipple reconstruction	17	Secondary	<i>Ad hoc</i> ⁶¹	"Are you satisfied with the sensitivity of the nipples?"	10-point scale from "unsatisfied" to "very satisfied"	1- nipple 2- sensation 3- satisf/import
Isenberg <i>et al.</i> , 2002 ⁶²	Prospective cohort	Skin-sparing mastectomy + reconstruction with (innervated) autologous flap	10	Primary	<i>Ad hoc</i> ⁶²	<ol style="list-style-type: none"> 1. "Return of sensation to the reconstructed breast" 2. "Return of erogenous sensation to the reconstructed breast" 	yes/no	<ol style="list-style-type: none"> 1. 1- breast 2- sensation 3- comparative 2. 1- breast 2- erogenous

Table 1 (continued)

Study (n = 135)	Study design	Surgery type	N ^a	Sensation endpoint	Survey (n = 124)	Sensation items (n = 215)	Response options	Item content ^b
Jahkola <i>et al.</i> , 1998 ⁶³	Cross-sectional	Breast-conserving surgery/ modified radical mastectomy	163	Secondary	<i>Ad hoc</i> ⁶³	<ol style="list-style-type: none"> 1. "Compared with the untreated breast, how is your breast pleasure sensation?" 2. "Compared with the untreated breast, how is your nipple pleasure sensation?" 3. "Compared with the untreated nipple, how is your nipple erection?" 	more than/ same/less than	<ol style="list-style-type: none"> 3- comparative 1- breast 2- erogenous 3- comparative 2- nipple 2- erogenous 3- comparative 3- nipple 2- erection 3- comparative
Jalini <i>et al.</i> , 2017 ⁶⁴	Cross-sectional	Mastectomy + reconstruction: 1. autologous flap 2. latissimus dorsi flap + implant + nipple reconstruction	32	Secondary	<i>Ad hoc</i> ⁶⁴	"Satisfaction with sensation of the reconstructed nipple"	10-point VAS	<ol style="list-style-type: none"> 1- nipple 2- sensation 3- satisf/import
Jin <i>et al.</i> , 2013 ⁶⁵	Cross-sectional	Nipple reduction	257	Secondary	<i>Ad hoc</i> ⁶⁵	"Was there a change in nipple sensation after the surgery compared to the preoperative state?"	4-point Likert scale from "complete absence" to "no change in sensation"	<ol style="list-style-type: none"> 1- nipple 2- sensation 3- comparative
Kalaaji <i>et al.</i> , 2013 ⁶⁶	Cross-sectional	Augmentation mammoplasty	121	Secondary	<i>Ad hoc</i> ⁶⁶	"To what degree are you satisfied with sensation of the skin of the breast after operation?"	unsatisfied/no opinion/satisfied	<ol style="list-style-type: none"> 1- breast 2- sensation 3- satisf/import
Kaminsky <i>et al.</i> , 2015 ⁶⁷	Cross-sectional	Breast-conserving surgery/ Skin-sparing mastectomy + (expander-)implant-based reconstruction	10	Secondary	<i>Ad hoc</i> ⁶⁷	"Rate your nipple sensation:"	5-point Likert scale from "none" to "same as pre-surgery"	<ol style="list-style-type: none"> 1- nipple 2- sensation 3- comparative
Khan <i>et al.</i> , 2016 ⁶⁸	Cross-sectional	Skin-sparing mastectomy/ nipple-sparing mastectomy + reconstruction: 1. autologous flap 2. latissimus dorsi flap + implant	94	Primary	<i>Ad hoc</i> ⁶⁸	<ol style="list-style-type: none"> 1. "Do you have any numbness or tingling in your reconstructed breast?" 2. "Do you have any loss of pleasurable sensation in your reconstructed breast?" 	4-point Likert scale from "not at all" to "very much"	<ol style="list-style-type: none"> 1. 1- breast 2- numbness 3- absolute 2. 1- breast 2- erogenous 3- absolute

Table 1 (continued)

Study (n = 135)	Study design	Surgery type	N ^a	Sensation endpoint	Survey (n = 124)	Sensation items (n = 215)	Response options	Item content ^b
Kim <i>et al.</i> , 2019 ⁶⁹	Cross-sectional	Skin-sparing mastectomy/ nipple-sparing mastectomy + (expander-)implant-based reconstruction	140	Secondary	<i>Ad hoc</i> ⁶⁹	<ol style="list-style-type: none"> 1. "Touching the nipple-areola complex is:" 2. "Compared to before the operation, change of nipple reaction to cold or touch is:" 	<ol style="list-style-type: none"> 1. 5-point Likert scale from "very unpleasant" to "very pleasant" 2. 5-point Likert scale from "no reaction" to "unchanged" 	<ol style="list-style-type: none"> 1. 1- nipple 2- erogenous 3- absolute 2. 1- nipple 2- erection 3- comparative
Kompatscher <i>et al.</i> , 2004 ⁷⁰	Cross-sectional	Augmentation mammoplasty	18	Secondary	<i>Ad hoc</i> ⁷⁰	"Has sensation returned to normal?"	yes/no	<ol style="list-style-type: none"> 1- breast 2- sensation 3- comparative
Lagergren <i>et al.</i> , 2007 ⁷¹	Cross-sectional	Skin-sparing mastectomy + (expander-)implant-based reconstruction	14	Primary	<i>Ad hoc</i> ^{71,72}	<ol style="list-style-type: none"> 1. "Do you experience any kind of sensibility in your reconstructed breast when touching it, taking a shower, etc.?" 2. "Can you feel pain in your reconstructed breast?" 3. "Can you feel touch in your reconstructed breast?" 4. "Can you feel temperature (warmth, cold) in your reconstructed breast?" 5. "Do you experience the sensibility in your reconstructed breast as weaker or stronger compared with the other breast?" 	<ol style="list-style-type: none"> 1. - 4. yes/no 5. weaker/stronger 	<ol style="list-style-type: none"> 1. 1- breast 2- sensation 3- absolute 2. 1- breast 2- pain 3- absolute 3. 1- breast 2- touch 3- absolute 4. 1- breast 2- temperature 3- absolute 5. 1- breast 2- sensation 3- comparative
Lagergren <i>et al.</i> , 2010 ⁷²	Cross-sectional	Skin-sparing mastectomy + (expander-)implant-based reconstruction	24	Primary				
Lee, C. N. <i>et al.</i> , 2018 ⁷³	Prospective cohort	Skin-sparing mastectomy + reconstruction: 1. (expander-)implant 2. autologous flap	96	Secondary	<i>Ad hoc</i> ⁷³	"How often do you currently experience numbness in your chest area or arms?"	5-point Likert scale from "none of the time" to "all of the time"	<ol style="list-style-type: none"> 1- breast 2- numbness 3- absolute
Lee, T. J. <i>et al.</i> , 2012 ⁷⁴	Cross-sectional	Skin-sparing mastectomy + reconstruction with autologous flap + nipple reconstruction	35	Secondary	Survey by Spear <i>et al.</i> ⁷⁵	See Spear <i>et al.</i>	See below	See below

Table 1 (continued)

Study (n = 135)	Study design	Surgery type	N ^a	Sensation endpoint	Survey (n = 124)	Sensation items (n = 215)	Response options	Item content ^b
Liew <i>et al.</i> , 1996 ⁷⁶	Cross-sectional	Mastectomy + reconstruction with autologous flap	21	Primary	<i>Ad hoc</i> ⁷⁶	1. "Is there any sensation in the reconstructed breast?" 2. "Is the sensory recovery progressive?"	yes/no	1. 1- breast 2- sensation 3- absolute 2. 1- breast 2- sensation 3- comparative
Losken <i>et al.</i> , 2001 ⁷⁷	Cross-sectional	Mastectomy + reconstruction with autologous flap + nipple reconstruction	11	Secondary	<i>Ad hoc</i> ⁷⁷	"Satisfaction with sensation of the reconstructed nipple"	101-point VAS	1- nipple 2- sensation 3- satisf/import
Lossing <i>et al.</i> , 1998 ⁷⁸	Cross-sectional	Mastectomy + reconstruction with autologous flap + nipple reconstruction	21	Secondary	<i>Ad hoc</i> ⁷⁸	"Do you have sensation in your areola?"	yes/no	1- nipple 2- sensation 3- absolute
Magarakis <i>et al.</i> , 2013 ⁷⁹	Cross-sectional	Breast-conserving surgery/ nipple-sparing mastectomy + reconstruction: 1. (expander-)implant 2. (innervated) autologous flap	37	Primary	<i>Ad hoc</i> ⁷⁹	"Do you feel erotic sensation in your reconstructed breast?"	5-point Likert scale from "strongly disagree" to "strongly agree"	1- breast 2- erogenous 3- absolute
Makboul <i>et al.</i> , 2016 ⁸⁰	Cross-sectional	Reduction mammoplasty/ mastopexy	60	Secondary	<i>Ad hoc</i> ^{80,81}	"Nipple sensation"	normal/decreased/lost	1- nipple 2- sensation 3- comparative
Makboul <i>et al.</i> , 2017 ⁸¹	Cross-sectional	Reduction mammoplasty/ mastopexy	60	Secondary				
Marconi <i>et al.</i> , 1993 ⁸²	Cross-sectional	Reduction mammoplasty/ mastopexy	25	Secondary	<i>Ad hoc</i> ⁸²	"Nipple-areola complex sensitivity"	unchanged/ increased/ decreased	1- nipple 2- sensation 3- comparative
McCulley <i>et al.</i> , 1999 ⁸³	Cross-sectional	Reduction mammoplasty/ mastopexy	90	Secondary	<i>Ad hoc</i> ⁸³	"Feeling in nipples since surgery"	normal/present but abnormal/absent	1- nipple 2- sensation 3- comparative
Mertz <i>et al.</i> , 2017 ⁸⁴	Cross-sectional	Breast-conserving surgery/ mastectomy + (expander-) implant-based reconstruction	574	Secondary	Breast Cancer Sequelae Cause	"Have you had numbness or decreased sensitivity in or around the area of your surgery?"	yes/no	1- breast 2- numbness 3- absolute

Table 1 (continued)

Study (<i>n</i> = 135)	Study design	Surgery type	<i>N</i> ^a	Sensation endpoint	Survey (<i>n</i> = 124)	Sensation items (<i>n</i> = 215)	Response options	Item content ^b
						Scales, subscale: sensory disturbances, validated ⁸⁵		
Minkowitz <i>et al.</i> , 2012 ⁸⁶	Cross-sectional	Augmentation mammoplasty	94	Secondary	<i>Ad hoc</i> ⁸⁶	"Do you experience numbness in the breast?"	yes/no	1- breast 2- numbness 3- absolute
Mizgala <i>et al.</i> , 2000 ⁸⁷	Cross-sectional	Reduction mammoplasty/ mastopexy	73	Secondary	<i>Ad hoc</i> ⁸⁷	"Effect of breast reduction surgery on nipple sensation"	more sensitivity/ no change/less sensitivity/pressure only/no sensitivity	1- nipple 2- sensation 3- comparative
Modaffari <i>et al.</i> , 2019 ⁸⁸	Cross-sectional	Skin-sparing mastectomy + (expander-)implant-based reconstruction	208	Secondary	<i>Ad hoc</i> ⁸⁸	"How much are you satisfied with the nipple-areola complex tactile sensation?"	10-point VAS	1- nipple 2- touch 3- satisf/import
Moscona <i>et al.</i> , 2006 ⁸⁹	Cross-sectional	Mastectomy + reconstruction with autologous flap	101	Secondary	<i>Ad hoc</i> ⁸⁹	"Touch sensation of the breast"	5-point Likert scale from "not natural" to "natural"	1- breast 2- touch 3- absolute
Müller <i>et al.</i> , 1974 ⁹⁰	Cross-sectional	Reduction mammoplasty/ mastopexy	100	Secondary	<i>Ad hoc</i> ⁹⁰	"Sensitivity in nipples"	satisfactory beyond any doubt/ not satisfactory/ improved/ unchanged	1- nipple 2- sensation 3- satisf/import
Nahabedian <i>et al.</i> , 2006 ⁹¹	Cross-sectional	Nipple-sparing mastectomy + reconstruction: 1. (expander-)implant 2. autologous flap	12	Secondary	<i>Ad hoc</i> ⁹¹	1. "Is sensation of the nipple-areola complex present or absent?" 2. "Is the sensation of the nipple-areola complex the same or different as before mastectomy?"	1. present/absent 2. same/different	1. 1- nipple 2- sensation 3- absolute 2. 1- nipple 2- sensation 3- comparative
Negosanti <i>et al.</i> , 2010 ⁹²	Cross-sectional	Skin-sparing mastectomy + reconstruction with autologous flap	20	Secondary	<i>Ad hoc</i> ⁹²	1. "Please define your level of sensitivity in the reconstructed breast and in the abdominal region."	1. 5-point Likert scale from "very poor" to "very good" 2. + 4. + 6. yes/no	1. 1- breast 2- sensation 3- absolute 2. 1- breast 2- touch

Table 1 (continued)

Study (n = 135)	Study design	Surgery type	N ^a	Sensation endpoint	Survey (n = 124)	Sensation items (n = 215)	Response options	Item content ^b
						<p>2. "Did you recover any tactile sensitivity?"</p> <p>3. "If the answer to 2. is yes, how long after surgery did you recover tactile sensitivity?"</p> <p>4. "Did you recover any thermal sensitivity?"</p> <p>5. "If the answer to 4. is yes, how long after surgery did you recover thermal sensitivity?"</p> <p>6. "Did you recover any pain sensitivity?"</p> <p>7. "If the answer to 6. is yes, how long after surgery did you recover pain sensitivity?"</p>	<p>3. + 5. + 7. < 3 months/ 3-6 months/ 6-9 months/ 9-12 months / >12 months</p>	<p>3- absolute</p> <p>3. 1- breast 2- touch 3- comparative</p> <p>4. 1- breast 2- temperature 3- absolute</p> <p>5. 1- breast 2- temperature 3- comparative</p> <p>6. 1- breast 2- pain 3- absolute</p> <p>7. 1- breast 2- pain 3- comparative</p>
Nguyen <i>et al.</i> , 2013 ⁹³	Cross-sectional	Reduction mammoplasty/mastopexy	203	Secondary	<i>Ad hoc</i> ⁹³	"Decreased nipple sensitivity resulting from the operation"	yes/no	<p>1- nipple</p> <p>2- sensation</p> <p>3- comparative</p>
Niechajev <i>et al.</i> , 2007 ⁹⁴	Randomized controlled trial	Augmentation mammoplasty	80	Secondary	<i>Ad hoc</i> ⁹⁴	<p>1. "Breast skin sensitivity"</p> <p>2. "Nipple sensitivity"</p>	normal/increase/slight loss/severe loss/no sensitivity	<p>1. 1- breast 2- sensation 3- comparative</p> <p>2. 1- nipple 2- sensation 3- comparative</p>
Okwueze <i>et al.</i> , 2006 ⁹⁵	Cross-sectional	Augmentation mammoplasty	33	Primary	<i>Ad hoc</i> ⁹⁵	<p>1. "Did surgery affect nipple/breast sensation?"</p> <p>2. "Did nipple/breast sensation improve with time?"</p> <p>3. "Was change in sensation bothersome?"</p> <p>4. "Description of change in sensation"</p> <p>5. "Change in sensation first noticed"</p>	<p>1. – 3. yes/no/don't know</p> <p>4. decreased/increased/painful/cannot explain</p> <p>5. soon after surgery/first month of surgery/later</p>	<p>1. 1- breast 2- sensation 3- comparative</p> <p>2. 1- breast 2- sensation 3- comparative</p> <p>3. 1- breast 2- sensation 3- satisf/import</p> <p>4. 1- breast 2- sensation 3- comparative</p> <p>5. 1- breast 2- sensation</p>

Table 1 (continued)

Study (n = 135)	Study design	Surgery type	N ^a	Sensation endpoint	Survey (n = 124)	Sensation items (n = 215)	Response options	Item content ^b
								3- comparative
Osinga <i>et al.</i> , 2014 ⁹⁶	Cross-sectional	Reduction mammoplasty/ mastopexy, augmentation mammoplasty	64	Secondary	<i>Ad hoc</i> ^{96,97}	"How happy are you with your breast sensibility and how would you rate it from 1-10?"	10-point VAS: 1=worst, 10=best	1- breast
Osinga <i>et al.</i> , 2017 ⁹⁷	Cross-sectional	Reduction mammoplasty/ mastopexy	259	Secondary				2- sensation
								3- satisf/import
Otterburn <i>et al.</i> , 2010 ⁹⁸	Cross-sectional	Mastectomy + reconstruction: 1. (expander-)implant 2. autologous flap 3. latissimus dorsi flap + implant + nipple reconstruction	199	Secondary	<i>Ad hoc</i> ⁹⁸	1. "Satisfaction with breast sensation" 2. "Satisfaction with nipple sensation"	5-point Likert scale from "most satisfied" to "not satisfied"	1. 1- breast 2- sensation 3- satisf/import 2. 1- nipple 2- sensation 3- satisf/import
Ou <i>et al.</i> , 2015 ⁹⁹	Cross-sectional	Nipple-sparing mastectomy + reconstruction: 1. (expander-)implant 2. autologous flap	42	Secondary	<i>Ad hoc</i> ⁹⁹	1. "Sensation of the nipple" 2. "Nipple arousal"	4-point Likert scale from "poor" to "excellent"	1. 1- nipple 2- sensation 3- absolute 2. 1- nipple 2- erogenous 3- absolute
Pan <i>et al.</i> , 2019 ¹⁰⁰	Cross-sectional	Nipple-sparing mastectomy + (expander-)implant-based reconstruction	41	Secondary	<i>Ad hoc</i> ¹⁰⁰	"Sensation in the nipple-areola complex"	4-point Likert scale from "no sensation" to "good sensation"	1- nipple 2- sensation 3- absolute
Pek <i>et al.</i> , 2019 ¹⁰¹	Cross-sectional	Nipple-sparing mastectomy + reconstruction: 1. (expander-)implant 2. autologous flap 3. latissimus dorsi flap + implant	133	Secondary	<i>Ad hoc</i> ¹⁰¹	1. "Sensation of the nipple-areola complex" 2. "Nipple-areola complex arousal"	4-point Likert scale from "poor" to "excellent"	1. 1- nipple 2- sensation 3- absolute 2. 1- nipple 2- erogenous 3- absolute
Peled <i>et al.</i> , 2014 ¹⁰²	Prospective cohort	Skin-sparing mastectomy + (expander-)implant-based reconstruction	51	Secondary	<i>Ad hoc</i> ¹⁰²	"Sensation of the nipple-areola complex"	4-point Likert scale from "very dissatisfied" to "very satisfied"	1- nipple 2- sensation 3- satisf/import

Table 1 (continued)

Study (n = 135)	Study design	Surgery type	N ^a	Sensation endpoint	Survey (n = 124)	Sensation items (n = 215)	Response options	Item content ^b
Peters <i>et al.</i> , 1997 ¹⁰³	Cross-sectional	Breast implant removal	100	Secondary	<i>Ad hoc</i> ¹⁰³	1. "Loss of nipple sensitivity" 2. "Loss of sensitivity in other areas of the breast"	1. 11-point Likert scale from "none" to "numb" 2. almost the complete breast/inframammary area/lateral portion/area around the nipple/medial portion of the breast/medial area of the upper arm	1. 1- nipple 2- sensation 3- absolute 2. 1- breast 2- sensation 3- absolute
Petit <i>et al.</i> , 2005 ¹⁰⁴	Cross-sectional	Nipple-sparing mastectomy + reconstruction: 1. (expander-)implant 2. autologous flap	289	Secondary	<i>Ad hoc</i> ^{104,105}	"Sensitivity of the nipple-areola complex"	10-point VAS	1- nipple 2- sensation 3- absolute
Petit <i>et al.</i> , 2006 ¹⁰⁵	Cross-sectional	Nipple-sparing mastectomy + reconstruction: 1. (expander-)implant 2. autologous flap	102	Secondary				
Pickford <i>et al.</i> , 1993 ¹⁰⁶	Cross-sectional	Reduction mammoplasty/mastopexy	25	Secondary	<i>Ad hoc</i> ¹⁰⁶	"Nipple-areola sensation"	unchanged/ present/diminished/ absent	1- nipple 2- sensation 3- comparative
Przybilski <i>et al.</i> , 1981 ¹⁰⁷	Cross-sectional	Reduction mammoplasty/mastopexy	685	Secondary	<i>Ad hoc</i> ¹⁰⁷	"Sensitivity of the nipple-areola complex"	like before the operation/ less than before the operation/ more than before the operation/none	1- nipple 2- sensation 3- comparative
Puonti <i>et al.</i> , 2011 ¹⁰⁸	Cross-sectional	Skin-sparing mastectomy + reconstruction with (innervated) autologous flap	40	Primary	<i>Ad hoc</i> ¹⁰⁸	"Sensation in TRAM flap"	10-point VAS	1- breast 2- sensation 3- absolute

Table 1 (continued)

Study (n = 135)	Study design	Surgery type	N ^a	Sensation endpoint	Survey (n = 124)	Sensation items (n = 215)	Response options	Item content ^b
Ren <i>et al.</i> , 2013 ¹⁰⁹	Cross-sectional	Nipple reduction	22	Secondary	<i>Ad hoc</i> ¹⁰⁹	"Sensation of the nipple"	4-point Likert scale from "no change in sensation" to "complete absence"	1- nipple 2- sensation 3- comparative
Robertson <i>et al.</i> , 2012 ¹¹⁰	Cross-sectional	Skin-sparing mastectomy + (expander-)implant-based reconstruction	223	Secondary	<i>Ad hoc</i> ¹¹⁰	"Sensibility of the breast"	negative/neutral/positive	1- breast 2- sensation 3- satisf/import
Sandsmark <i>et al.</i> , 1992 ¹¹¹	Cross-sectional	Reduction mammoplasty/mastopexy	292	Secondary	<i>Ad hoc</i> ¹¹¹	<ol style="list-style-type: none"> 1. "Tactile sensitivity of the nipple-areola complex" 2. "Erogenous sensation of the nipple-areola complex" 3. "Sensitivity of the breast to hot and cold" 4. "Reduced sensitivity in which part of the breast?" 5. "Return of sensation in the nipple-areola complex" 	<ol style="list-style-type: none"> 1. - 3. full/reduced/none 4. ? 5. <1 months/1-3 months/3-6 months/>6 months/none 	<ol style="list-style-type: none"> 1. 1- nipple 2- touch 3- absolute 2. 1- nipple 2- erogenous 3- absolute 3. 1- breast 2- temperature 3- absolute 4. 1- breast 2- sensation 3- absolute 5. 1- nipple 2- sensation 3- comparative
Schratt <i>et al.</i> , 2014 ¹¹²	Cross-sectional	Reduction mammoplasty/mastopexy	33	Primary	<i>Ad hoc</i> ¹¹²	"Changed sensation of the breast"	yes/no	1- breast 2- sensation 3- comparative
Serletti <i>et al.</i> , 1992 ¹¹³	Cross-sectional	Reduction mammoplasty/mastopexy	116	Secondary	<i>Ad hoc</i> ¹¹³	"Change in nipple sensation after the operation"	yes/no/no response	1- nipple 2- sensation 3- comparative
Shaffer <i>et al.</i> , 2019 ¹¹⁴	Cross-sectional	Nipple-sparing mastectomy + (expander-)implant-based reconstruction	91	Secondary	<i>Ad hoc</i> ¹¹⁴	"Degree of residual nipple sensation"	5-point Likert scale from "no sensation" to "normal sensation"	1- nipple 2- sensation 3- absolute

Table 1 (continued)

Study (n = 135)	Study design	Surgery type	N ^a	Sensation endpoint	Survey (n = 124)	Sensation items (n = 215)	Response options	Item content ^b
Shaikh-Naidu <i>et al.</i> , 2004 ¹¹⁵	Cross-sectional	Mastectomy + reconstruction: 1. (expander-)implant 2. autologous flap	437	Secondary	<i>Ad hoc</i> ¹¹⁵	"Breast sensation"	5-point Likert scale from "lowest level of satisfaction" to "highest level of satisfaction"	1- breast 2- sensation 3- satisf/import
Shan <i>et al.</i> , 2016 ¹¹⁶	Cross-sectional	Reduction mammoplasty/ mastopexy	46	Secondary	<i>Ad hoc</i> ¹¹⁶	<ol style="list-style-type: none"> "Nipple-areola complex feeling to pain compared to preoperative situation" "Nipple-areola complex feeling to temperature compared to preoperative situation" "Nipple-areola complex feeling to touch compared to preoperative situation" "Sexual feeling of the nipple-areola complex compared to preoperative situation" 	no feeling/serious decline/ dysesthesia/same as prior to surgery	<ol style="list-style-type: none"> 1- nipple 2- pain 3- comparative 1- nipple 2- temperature 3- comparative 1- nipple 2- touch 3- comparative 1- nipple 2- erogenous 3- comparative
Shaw <i>et al.</i> , 1997 ¹¹⁷	Cross-sectional	Mastectomy + reconstruction with autologous flap	29	Primary	<i>Ad hoc</i> ¹¹⁷	<ol style="list-style-type: none"> "I have feeling in the reconstructed breast when it is bumped in daily life." "I have feeling in the reconstructed breast when it is touched." "I have erotic sensation in my reconstructed breast." 	6-point Likert scale from "strong disagreement" to "strong agreement"	<ol style="list-style-type: none"> 1- breast 2- pressure 3- absolute 1- breast 2- touch 3- absolute 1- breast 2- erogenous 3- absolute
Shi <i>et al.</i> , 2015 ¹¹⁸	Cross-sectional	Augmentation mammoplasty	144	Secondary	<i>Ad hoc</i> ¹¹⁸	"Nipple-areola complex sensation"	5-point Likert scale from "very dissatisfied" to "very satisfied"	1- nipple 2- sensation 3- satisf/import
Shiau <i>et al.</i> , 2011 ¹¹⁹	Prospective cohort	Inverted nipple correction	17	Secondary	<i>Ad hoc</i> ¹¹⁹	"Has nipple sensation returned?"	yes/no	1- nipple 2- sensation 3- absolute
Smoll <i>et al.</i> , 2013 ¹²⁰	Cross-sectional	Reduction mammoplasty/ mastopexy	270	Secondary	<i>Ad hoc</i> ¹²⁰	"Nipple sensation"	reduced/normal	1- nipple 2- sensation

Table 1 (continued)

Study (n = 135)	Study design	Surgery type	N ^a	Sensation endpoint	Survey (n = 124)	Sensation items (n = 215)	Response options	Item content ^b
								3- absolute
Spear <i>et al.</i> , 2011 ⁷⁵	Cross-sectional	Skin-sparing mastectomy + reconstruction: 1. (expander-)implant 2. autologous flap + nipple reconstruction	59	Secondary	<i>Ad hoc</i> ⁷⁵	<ol style="list-style-type: none"> 1. "How is the sensation in your donor nipple?" 2. "How is the contractility of your donor nipple?" 3. "Has the role of your donor nipple in sexual arousal changed?" 	<ol style="list-style-type: none"> 1. 4-point Likert scale from "totally numb" to "sensation unchanged from before surgery" 2. 4-point Likert scale from "never contracts" to "contracts with normal stimulation" 3. 4-point Likert scale from "greatly decreased role" to "unchanged role" 	<ol style="list-style-type: none"> 1. 1- nipple 2- sensation 3- comparative 2. 1- nipple 2- erection 3- absolute 3. 1- nipple 2- sensation 3- impact
Stokes <i>et al.</i> , 2004 ¹²¹	Cross-sectional	Augmentation mammoplasty	19	Secondary	<i>Ad hoc</i> ¹²¹	"How would you rate the sensation in your breasts compared to how they felt before your surgery"	more sensitive/ similar sensation/ less sensitive/numb	<ol style="list-style-type: none"> 1- breast 2- sensation 3- comparative
Struckmann <i>et al.</i> , 2016 ¹²²	Cross-sectional	Mastectomy + reconstruction with autologous flap	142	Secondary	<i>Ad hoc</i> ¹²²	"Touch sensation of the breast"	5-point Likert scale from "none" to "normal"	<ol style="list-style-type: none"> 1- breast 2- touch 3- absolute
Swanson, 2013 ¹²³	Prospective cohort	Reduction mammoplasty/ mastopexy, augmentation mammoplasty	125	Secondary	<i>Ad hoc</i> ^{123,124}	"Postoperative nipple numbness"	yes/no	<ol style="list-style-type: none"> 1- nipple 2- numbness 3- absolute
Swanson, 2013 ¹²⁴	Prospective cohort	Augmentation mammoplasty	281	Secondary				
Swanson, 2016 ¹²⁵	Cross-sectional	Augmentation mammoplasty	100	Secondary	<i>Ad hoc</i> ¹²⁵	<ol style="list-style-type: none"> 1. "Nipple numbness" 2. "Location of numbness" 3. "Did feeling of the nipple return?" 	<ol style="list-style-type: none"> 1. yes/no 2. unilateral/ bilateral 3. yes/no/partially 	<ol style="list-style-type: none"> 1. 1- nipple 2- numbness 3- absolute 2. 1- nipple 2- numbness 3- absolute

Table 1 (continued)

Study (n = 135)	Study design	Surgery type	N ^a	Sensation endpoint	Survey (n = 124)	Sensation items (n = 215)	Response options	Item content ^b
								3. 1- nipple 2- sensation 3- comparative
Tairysh <i>et al.</i> , 1998 ¹²⁶	Cross-sectional	Reduction mammoplasty/mastopexy	44	Secondary	<i>Ad hoc</i> ^{126,127}	1. "Changed sensitivity of the nipple-areola complex" 2. "How bothersome is decreased sensitivity?"	1. unchanged/only temporary impairment/decreased sensitivity 2. bothersome/not bothersome	1. 1- nipple 2- sensation 3- comparative
Tairysh <i>et al.</i> , 2000 ¹²⁷	Cross-sectional	Reduction mammoplasty/mastopexy	403	Secondary				2. 1- nipple 2- sensation 3- satisf/import
Temel <i>et al.</i> , 2015 ¹²⁸	Cross-sectional	Reduction mammoplasty/mastopexy	110	Secondary	<i>Ad hoc</i> ¹²⁸	"Sensation of the nipple-areola complex"	same/worse/better than before the surgery	1- nipple 2- sensation 3- comparative
Thompson <i>et al.</i> , 1990 ¹²⁹	Cross-sectional	Mastectomy + (expander-) implant-based reconstruction	29	Secondary	<i>Ad hoc</i> ¹²⁹	"Do you have altered chest sensation?"	yes/no	1- breast 2- sensation 3- comparative
Unukovych <i>et al.</i> , 2014 ¹³⁰	Randomized controlled trial	Skin-sparing mastectomy	43	Secondary	<i>Ad hoc</i> ¹³⁰	1. "To what extent is your sensation in the breast area reduced?" 2. "To what extent does your reduced sensation affect your wish to touch yourself in the breast area?"	4-point Likert scale from "not at all" to "much"	1. 1- breast 2- sensation 3- comparative 2. 1- breast 2- sensation 3- impact
Van Verschuer <i>et al.</i> , 2016 ¹³¹	Cross-sectional	Nipple-sparing mastectomy/skin-sparing mastectomy + (expander-) implant-based reconstruction	45	Primary	<i>Ad hoc</i> ¹³¹	1. "Nipple-areola complex sensitivity compared with before the operation" 2. "Did sexual pleasure change since the operation because of loss of nipple-areola complex sensitivity?" 3. "Touching the nipple-areola complex is:" 4. "Change of nipple reaction to cold or touch:"	1. 5-point Likert scale from "insensitive" to "hypersensitive" 2. 5-point Likert scale from "absent" to "unchanged" 3. 5-point Likert scale from "very unpleasant" to "very pleasant"	1. 1- nipple 2- sensation 3- comparative 2. 1- nipple 2- erogenous 3- impact 3. 1- nipple 2- erogenous 3- absolute 4. 1- nipple 2- erection 3- comparative

Table 1 (continued)

Study (n = 135)	Study design	Surgery type	N ^a	Sensation endpoint	Survey (n = 124)	Sensation items (n = 215)	Response options	Item content ^b
							4. 5-point Likert scale from "no reaction" to "unchanged"	
Von Sperling <i>et al.</i> , 2011 ¹³²	Cross-sectional	Reduction mammoplasty/mastopexy	109	Secondary	<i>Ad hoc</i> ¹³³	1. "Decreased sensation" 2. "Area of decreased sensation" 3. "How bothered are you by sensory changes in your breast?"	1. yes/no 2. ? 3. 10-point VAS	1. 1- breast 2- sensation 3- absolute 2. 1- breast 2- sensation 3- absolute 3. 1- breast 2- sensation 3- satisf/import
Von Sperling <i>et al.</i> , 2011 ¹³³	Cross-sectional	Augmentation mammoplasty	142	Secondary	<i>Ad hoc</i> ¹³²	"Decreased sensation"	yes/no	1- breast 2- sensation 3- absolute
Wolter <i>et al.</i> , 2017 ¹³⁴	Cross-sectional	Reduction mammoplasty/mastopexy, augmentation mammoplasty	68	Secondary	<i>Ad hoc</i> ^{134,135}	"Breast gland sensitivity"	4-point Likert scale from "none" to "very good"	1- breast 2- sensation 3- absolute
Wolter <i>et al.</i> , 2017 ¹³⁵	Cross-sectional	Reduction mammoplasty/mastopexy	174	Secondary				
Yueh <i>et al.</i> , 2009 ¹³⁶	Cross-sectional	Nipple-sparing mastectomy + (expander-)implant-based reconstruction	10	Secondary	<i>Ad hoc</i> ¹³⁶	"Sensation of the nipple-areola complex: 1. ability to detect light touch 2. ability to detect pressure 3. ability to detect temperature 4. ability to detect pain 5. projectile responsiveness to touch"	Each of the 5 criteria was evaluated between 0-2 points, and the sum of the scores could range between 0-10 points	1. 1- nipple 2- touch 3- absolute 2. 1- nipple 2- pressure 3- absolute 3. 1- nipple 2- temperature 3- absolute 4. 1- nipple 2- pain 3- absolute 5. 1- nipple 2- erection 3- absolute

Table 1 (continued)

Study (n = 135)	Study design	Surgery type	N ^a	Sensation endpoint	Survey (n = 124)	Sensation items (n = 215)	Response options	Item content ^b
Zelken <i>et al.</i> , 2016 ¹³⁷	Cross-sectional	Augmentation mammoplasty	11	Secondary	<i>Ad hoc</i> ¹³⁷	"Nipple sensitivity after the operation"	more sensitive/ no change in sensation	1- nipple 2- sensation 3- comparative
Zenn <i>et al.</i> , 2009 ¹³⁸	Cross-sectional	Mastectomy + breast reconstruction + nipple reconstruction	88	Secondary	<i>Ad hoc</i> ¹³⁸	1. "Sensation of the nipple" 2. "Time frame for recovery of nipple sensation" 3. "Erectile function of the nipple"	1. + 3. 5-point Likert scale from "poor" to "same" 2. ?	1. 1- nipple 2- sensation 3- absolute 2. 1- nipple 2- sensation 3- comparative 3. 1- nipple 2- erection 3- absolute

^a Number of patients

^b 1- Area (nipple, breast)

2- Aspect (sensation, erogenous sensation, touch sensation, numbness, temperature sensation, nipple erection, pain sensation, pressure sensation)

3- Question type (absolute, comparative, satisfaction/importance, impact)

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