

Contents

Contributors	xi
1 Introduction to activewear	1
<i>Joanne Yip, Andrew Frank Lando</i>	
1.1 Introduction to activewear	1
1.2 Definition of activewear	1
1.3 Types of activewear	3
1.4 Market overview	8
1.4.1 North America market	10
1.4.2 UK market	12
1.4.3 Chinese market	13
1.5 Key factors that influence purchase intentions of activewear	14
1.5.1 Innovation	16
1.5.2 Fit	16
1.5.3 Durability	17
1.5.4 Design	17
1.5.5 Comfort	18
1.5.6 Versatility	18
1.6 Conclusion	19
References	19
2 Activewear designs and innovations	25
<i>Nico Liu</i>	
2.1 Introduction	25
2.2 Functional brands: their innovative products	26
2.2.1 Nike	26
2.2.2 Adidas	27
2.2.3 Under amour	28
2.2.4 Puma	31
2.2.5 Lululemon Athletica	32
2.3 Functional brands: from function to fashion	34
2.3.1 Nike	34
2.3.2 Adidas	34
2.4 Fashion brands: activewear collections	35
2.4.1 Zara	36
2.4.2 H&M	37
2.5 Lingerie brands: activewear collections	37
2.5.1 Victoria sport	37
2.5.2 CW-X	38
2.6 Athletic leisurewear trends	40
2.7 Conclusions	41
References	42

3	Textile fibers and fabrics	47
	<i>Joanne Yip, Wing-Yu Chan</i>	
3.1	Introduction	47
3.2	Materials requirements of activewear	47
3.2.1	Common types of fibers	49
3.2.2	Innovative types of fibers	50
3.2.3	Innovative types of fabrics	56
3.2.4	Fabric finishing	60
3.3	Innovations for sustainability	64
3.3.1	Recycling	64
3.3.2	Replacing unsustainable materials	65
3.4	Conclusion	68
	References	68
4	Narrow fabric elastics and accessories for activewear	73
	<i>Joanne Yip, Olivia Ho-Yi Fung, Tsz-ling Ng</i>	
4.1	Introduction	73
4.2	Functionality in activewear	73
4.2.1	Support of the breasts	73
4.2.2	Ease of movement	77
4.2.3	User-friendliness	78
4.3	Esthetics	81
4.4	Smart technology	84
4.5	Conclusion	87
	References	87
5	Evaluation of perceived comfort and functional performance of activewear	89
	<i>Rong Liu, Elaine Fung, Younus Abida</i>	
5.1	Introduction	89
5.2	Process of perception of comfort	90
5.3	Methods of evaluating perceived comfort	91
5.3.1	Likert scale	92
5.3.2	Visual analogue scale	93
5.4	Evaluation of functional performance: fabric level (2D)	93
5.4.1	Physical–mechanical performance	93
5.4.2	Thermo-moisture properties and evaluation	98
5.4.3	Chemical (or biochemical) properties and evaluation	101
5.5	Evaluation of functional performances: clothing level (3D)	103
5.5.1	Manikin assessment in climatic chamber	104
5.5.2	Psycho-physiological evaluation in human trials	104
5.5.3	Biomechanical evaluation in wear trials	108
5.6	Conclusion	113
	References	114

6	Compression technology	119
	<i>Kit-lun Yick</i>	
6.1	Introduction	119
6.2	Current design of compression activewear	122
6.2.1	Cross-training compression tights	122
6.2.2	Running compression tights	123
6.2.3	Training and sports tights	124
6.2.4	Cycling compression tights	124
6.2.5	Compression activewear for swimming	126
6.3	Pressure induced by compression activewear	126
6.3.1	Experimental	127
6.3.2	Results of pressure evaluation	128
6.4	Problems in designing compression activewear	131
6.4.1	Variations in body shapes	131
6.4.2	Changes in body movements	131
6.4.3	Loss of fabric elasticity	132
6.4.4	Evaluation of garment pressure	132
6.4.5	Subjective perception of garment discomfort	133
6.5	Conclusion	134
	References	135
7	3D printing technologies: current applications, future trends, and challenges	139
	<i>Lushan Sun</i>	
7.1	Introduction	139
7.2	Integrating 3D printing with 3D CAD modeling	139
7.2.1	Fully 3D printed activewear with direct 3D CAD modeling	140
7.2.2	Fully 3D printed activewear with computational 3D modeling	141
7.2.3	3D partially printed activewear with direct 3D CAD modeling	142
7.2.4	3D printing integrated footwear with computational 3D modeling	144
7.2.5	3D fully printed footwear with computational 3D modeling	144
7.3	Technology and material capabilities in activewear prototyping	146
7.4	Advantages of 3D printing activewear and skills involved	148
7.4.1	Design complexity and efficiency	148
7.4.2	Skills and knowledge for 3D printing activewear	149
7.5	Conclusion	150
	References	151
8	Activewear design for competition: case study for Hong Kong rowing team	153
	<i>Chu-po Ho, Vannesa Chu</i>	
8.1	Introduction	153
8.2	Specific requirements of rowing as a sport	153
8.2.1	Biomechanics of rowing	154
8.2.2	Design requirements of rowing uniform	154

8.3	Design and development of new uniform for Hong Kong rowing team	156
8.3.1	Size and fit	156
8.3.2	Material	159
8.3.3	Design details	160
8.4	Evaluation of new prototype	162
8.5	Conclusion	167
	References	168
9	Yoga bra design for elderly women	173
	<i>Newman Lau, Jun Zhang, Joanne Yip, Winnie Yu</i>	
9.1	Basic requirements for yoga bra design	173
9.2	Design and development of new yoga bra for older women	177
9.2.1	Psychological needs	177
9.2.2	Physical needs	178
9.2.3	Material selection	182
9.2.4	Design sketches	185
9.3	Conclusion	188
9.4	Future plans	188
	References	188
10	An innovative tank top equipped with biofeedback system for adolescents with early scoliosis	193
	<i>Joanne Yip, Garcia Kwok</i>	
10.1	Introduction	193
10.2	Literature review	194
10.2.1	Introduction on scoliosis	195
10.2.2	Scoliosis treatment	195
10.2.3	Bracing therapy problems	197
10.2.4	Patient compliance	197
10.2.5	Behavioral methods for compliance enhancement	198
10.2.6	Noninvasive treatment: bracing therapy	198
10.3	Importance of correcting posture	199
10.3.1	Prevalence of poor posture and possible reasons	199
10.3.2	Corrected standing posture	200
10.3.3	Correct sitting posture	200
10.4	Biofeedback systems	200
10.4.1	Introduction on biofeedback systems	200
10.4.2	Surface electromyography	202
10.4.3	Application of biofeedback system on scoliosis subjects	202
10.5	Experimental design and results	204
10.5.1	Section summary	204
10.5.2	Experimental design	205
10.5.3	Design sketch and description of body mapping for tank-top	205

10.5.4 Material selection and physical testing results	205
10.5.5 Posture monitoring sensors	214
10.5.6 Wear trial and evaluation	215
10.6 Conclusion	218
References	220
Index	225