



# The De-automatizing Function of Mindfulness Facets: an Empirical Test

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## Abstract

**Objectives** Building upon the theoretical model of de-automatization, according to which the de-automatizing effect of mindfulness on cognitive processes has desirable health and social outcomes, we hypothesized that (1) dispositional mindfulness facets would be related to higher well-being (higher life satisfaction, lower perceived stress), and positive social outcomes (greater perspective taking, lower use of stereotypes); (2) these effects would be mediated by lower rumination, higher cognitive flexibility, higher decentering, and lower thought suppression, identified as de-automatization mediators.

**Methods** We tested this mediational model with SEM, in a large sample ( $N = 1153$ ).

**Results** Results supported the hypothesized model more for individual than for social outcomes. Cognitive flexibility, decentering, and to a smaller extent suppression mediated the relationships between mindfulness facets and the two well-being outcomes, while rumination was a mediator only in the model for perceived stress. Acting with awareness, nonjudging, and nonreactivity had mixed relationships with perspective taking: positive via cognitive flexibility, negative via rumination; rumination instead conveyed a positive association between observing and perspective taking. Cognitive flexibility also mediated the positive relationships between observing and describing and perspective taking. Acting with awareness, nonjudging, and nonreactivity were negatively related to stereotyping only via reduced suppression. Effects sizes (standardized indirect effects) were small to medium (from 0.02 to 0.20 in absolute value).

**Conclusions** The association between dispositional mindfulness and mental health indicators may be partially explained by a reduction in maladaptive automatized cognitive processes, while only some features of de-automatization positively relate to social outcomes.

**Keywords** Mindfulness · Automaticity · Decentering · Rumination · Cognitive flexibility

Automatization is a type of information processing that proceeds without volitional control and without requiring attention, because it activates learned sequences of elements stored in long-term memory (Schneider and Shiffrin 1977). Although automaticity is mostly the natural result of learning, it has both bright and dark sides. On the one hand, automatization saves attentional resources, helps individuals adapt to their social environment (e.g., through nonconscious mimicry of others during interactions), and let them behave consistently with their inner motivations (Bargh and Chartrand 1999). On the other hand, some features of highly automatized

cognitive processes and behaviors—such as unconsciousness, lack of self-control, and unnecessary elaborative processing of information—have negative consequences for individuals. Examples of this include stereotype activation and categorization-based biases (Sassenberg and Moskowitz 2005); indulgence in unhealthy food-, sleep-, and exercise-related habits (Galla and Duckworth 2015); and risky actions, such as texting while driving or walking (Panek et al. 2015), and addictive behaviors (Tiffany and Conklin 2000). Lack of self-control may also result in maladaptive, automatized thought processes, such as the ones involved in rumination and cognitive distortions (Andersen and Limpert 2001).

According to the theoretical model of de-automatization proposed by Kang et al. (2013), the detrimental aspects of automatization can be counteracted by specific features of mindfulness, namely awareness, sustained attention, focus on the present, and nonjudgmental acceptance. These features

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of mindfulness are not expected to discontinue all the forms of automaticity, but only to help individuals recognize when automatized emotional reactions and thought processes have become maladaptive. Being aware of these maladaptive cognitive and emotional processes gives control over them, thus providing well-being and social-oriented benefits (Kang et al. 2013).

Consistent with research showing that mindfulness is associated with enhanced executive functions (Gallant 2016; Short et al. 2016), the de-automatization model postulated that awareness, sustained attention, present focus, and nonjudgmental acceptance (1) cease automatic inference processing; (2) enhance attentional control and cognitive flexibility; (3) facilitate meta-cognitive insight, which is the recognition of thoughts as transient mental states (Teasdale 1999); and (4) prevent thoughts suppression or distortion. These four cognitive mechanisms together constitute the de-automatizing function of mindfulness, which generates adaptive self-regulation, hence desirable societal and individual health outcomes (Kang et al. 2013).

The de-automatization model is consistent with previous research showing that experimentally induced mindfulness weakens spontaneous approach reactions elicited by attractive food (Papies et al. 2012), the relation between automatic alcohol motivation and heavy drinking (Ostafin et al. 2012), implicit race and age bias, as measured by automatic associations (Lueke and Gibson 2015), and linguistic intergroup bias (Tincher et al. 2016). However, de-automatization may be a vehicle for mental health and positive social outcomes also as far as dispositional mindfulness is concerned. In fact, several studies showed that the link between dispositional mindfulness and psychological distress—including depressive symptoms—was mediated by individual characteristics counteracting—or fostering—immersion into internal experiences and automatic reactivity to the content of thoughts. These individual characteristics are non-attachment (Whitehead et al. 2019), which is a flexible, adaptive tendency to relate to one's experiences without clinging to them, for instance letting go of regrets and accepting that positive experiences do not last forever (Sahdra et al. 2016), rumination (Alleva et al. 2014; Coffey et al. 2010), and decentering (Brown et al. 2015), which is the capacity to step outside one's personal perspective of a lived experience (Safran and Segal 1990).

Regarding decentering in particular, Shapiro et al. (2006) theorized that it was the main mediator in the relationship between mindfulness and well-being, and that it was in turn related to four second-level mediators: values clarification, cognitive flexibility, self-regulation, and exposure (the ability to stay with unpleasant feelings). According to the model by Shapiro et al. (2006), decentering facilitates a more adaptive, values-consistent, flexible responding to the environment, which is then associated with higher psychological health.

This mediation model received some empirical confirmation both when assessing mindfulness as dispositional attention and awareness (Pearson et al. 2015) and when using the acting with awareness, nonjudging, and nonreactivity facets of the Five Facet Mindfulness Questionnaire (FFMQ) (Brown et al. 2015). However, this model did not address the benefits that decentering-related mechanisms of dispositional mindfulness may have on social outcomes, and its mechanisms only partially cover the de-automatizing function of dispositional mindfulness.

This study aimed to give empirical support to the theoretical model of de-automatization. We hypothesized that de-automatized cognitive processes, represented by lower rumination (proxy for automatic inference processing), higher cognitive flexibility, higher decentering (proxy for meta-cognitive insight), and lower thought suppression, mediated the relationships between dispositional mindfulness and well-being (higher satisfaction with life and lower perceived stress) and social outcomes (greater perspective taking and lower use of stereotypes).

## Method

### Participants

Participants were Italian adults recruited from the general population. Part of the recruitment (yielding around half of the sample) was carried out by six research assistants, while the other part was carried out by undergraduates, who recruited six people each in return for course credit. Given the large number of direct and indirect effects to be estimated in the model, and the possibility to find small-sized associations, especially between mindfulness and social outcomes (e.g., Dekeyser et al. 2008), we aimed to reach around 1000 participants (Wolf et al. 2013). One of the outcome variables in our model was stereotype use, concerning relevant minority groups in the Italian society: Eastern-European immigrants, Roma people, and Muslims. Following the intergroup contact literature (e.g., Pettigrew and Tropp 2006), and consistent with the studies involving—hence separating—ingroups and outgroups (Hewstone et al. 2002), we had to exclude from the analysis the participants belonging to these groups, so to validly assess the construct. However, as recruiters were instructed to send the questionnaire only to Italian people, to avoid as much as possible overlaps with the outgroups of the stereotype measure, the number of excluded participants was very low (four people). After such exclusion, the sample comprised 1153 participants (57% women), who ranged in age from 18 to 82 years ( $M = 30.29$ ;  $SD = 12.84$ ).

## Procedures

Participation was voluntary and without remuneration. Recruiters gave respondents a link to access an online questionnaire, which began with a brief explanation of the data collection and related ethical rules, informing participants of the possibility to leave questions blank, to contact the research team responsible for the data collection, and to withdraw their data, if desired. Respondents then gave their informed consent, provided sociodemographic details, and completed the following measures.

## Measures

**Dispositional Mindfulness** To have a multidimensional measure of dispositional mindfulness, we used the Five Facet Mindfulness Questionnaire (FFMQ, Baer et al. 2006; Italian validated version by Giovannini et al. 2014), with items rated on a 1- to 5-point Likert-type scale. The five subscales measure individual tendencies to (a) notice bodily sensations and physical stimuli (observing; “I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing”); (b) label and describe feelings and experiences with words (describing; “I can easily put my beliefs, opinions, and expectations into words”); (c) engage in activities with awareness (acting with awareness; “When I do things, my mind wanders off and I’m easily distracted”, reversed item); and (d) have a nonjudgmental and accepting attitude toward own experience (nonjudging; “I make judgments about whether my thoughts are good or bad”, reversed item); step back from thoughts and emotions, without being immersed in them (nonreactivity; “When I have distressing thoughts or images, I just notice them and let them go”). After appropriate recoding, higher scores indicated higher levels of mindfulness. All the facets showed good internal reliability (acting with awareness,  $\alpha = 0.89$ ; nonjudging,  $\alpha = 0.86$ ; nonreactivity,  $\alpha = 0.74$ ; observing,  $\alpha = 0.79$ ; describing,  $\alpha = 0.88$ ).

**Rumination** To assess the individual tendency for ruminative thinking, we employed the 12 items of the self-rumination subscale of the Rumination-Reflection Questionnaire (RRQ; Trapnell and Campbell 1999; Italian validated version by Vannucci and Chiorri 2018; “I often reflect on episodes in my life that I should no longer concern myself with”), with items scored on a 5-point Likert-type agreement scale ( $\alpha = 0.90$ ).

**Cognitive Flexibility** To measure cognitive flexibility, we employed an Italian translation of the 12-item Cognitive Flexibility scale by Martin and Rubin (1995; “I can communicate an idea in many different ways”), which underwent a back-translation procedure; items were on a 6-point agreement scale ( $\alpha = 0.79$ ).

**Decentering** To measure decentering, we employed an Italian translation (also back-translated) of the Decentering subscale of the Experiences Questionnaire (EQ; Fresco et al. 2007; “I can actually see that I am not my thoughts”), with items on a 5-point Likert-type scale (from 1 = never to 5 = always;  $\alpha = 0.86$ ).

**Thought Suppression** We measured the individual tendency to suppress thoughts with the 15-item White Bear Suppression Inventory (WBSI; Wegner and Zanakos 1994; Italian validated version by Pica et al. 2015; “I often have thoughts that I try to avoid”), with items on a 5-point agreement scale ( $\alpha = 0.92$ ).

**Subjective Well-being** Subjective well-being was measured by the Satisfaction with Life Scale (Diener et al. 1985; “The conditions of my life are excellent”) in its Italian translation provided by the authors; items were on a 7-point agreement scale ( $\alpha = 0.90$ ).

**Perceived Stress** To measure the ability to handle stressful events, we employed an Italian translation (also back-translated) of the 10-item Perceived Stress Scale (PSS; Cohen et al. 1983; “In the last month, how often have you found that you could not cope with all the things that you had to do?”), with items on a Likert-type response scale, from 0 = never to 4 = very often ( $\alpha = 0.82$ ).

**Perspective Taking** The perspective taking subscale of the Interpersonal Reactivity Index (IRI; Davis 1983; Italian validated version by Albiero et al. 2006; “Before criticizing somebody, I try to imagine how I would feel if I were in their place”) measured dispositional perspective taking. Items were on a 5-point Likert-type scale, from 1 = does not describe me well to 5 = describes me very well ( $\alpha = 0.80$ ).

**Stereotype Use** To measure stereotyping, we employed a scale based on a stereotype measure used in Bastian and Haslam (2006). They had a list of common stereotypes for Aboriginal people, and they used those stereotypic adjectives in items such as “The view of Aboriginal people as more—stereotypic adjective—has persisted because of factors that are internal to that group.” With the aim of having a general measure for endorsement of negative stereotypes, considering different outgroups and nonspecific stereotypic views, we asked a general question, referring to five outgroups about which people often have stereotypes in Italy (Eastern-European immigrants, Muslims, and Roma people). Each outgroup represented one item. The general question was: “How much do you think the negative view people often have about each of the groups indicated below is due to the real characteristics of the people belonging to that group?”, and the Likert-type response scale went from 1 = not at all to 7 = very much. Then, the list of outgroups followed ( $\alpha = 0.89$ ).

### Data Analyses

To test the mediational model on de-automatization, operationalized as reported in Fig. 1, we performed a structural equation model (SEM) using *Mplus* 6.11 (Muthén and Muthén 2011). To reduce the complexity of the model, we employed the parceling technique.

We first performed exploratory factor analysis (EFA) to test the unidimensionality of each latent construct and derive loadings to allocate items into parcels. All scales' items had meaningful factor loadings except the fifth item of the Cognitive Flexibility scale (Martin and Rubin 1995; loading < 0.10), which was therefore excluded from subsequent analyses and parcels. To further test the validity and unidimensionality of each measure (Little et al. 2002), we performed confirmatory factor analysis (CFA) for categorical data (fit indexes reported in Table 1): goodness of fit was satisfactory for all the measures. For what concerns the FFMQ, CFA supported both a five-factor structure—keeping the facets separate—and the unidimensionality of each facet, thereby supporting the parceling of each single facet, and the design of our mediational models. Both EFA and CFA were performed with the R (R Core Team 2019) package lavaan (Rosseel 2012).

Then, we created parcels for all scales except the one on stereotype use, which was composed of three items only. We followed the item-to-construct balance approach (Little et al. 2002): for each latent construct, the related items were assigned to three parcels, selected by balancing the different magnitudes of factor loadings derived from EFA in each parcel.

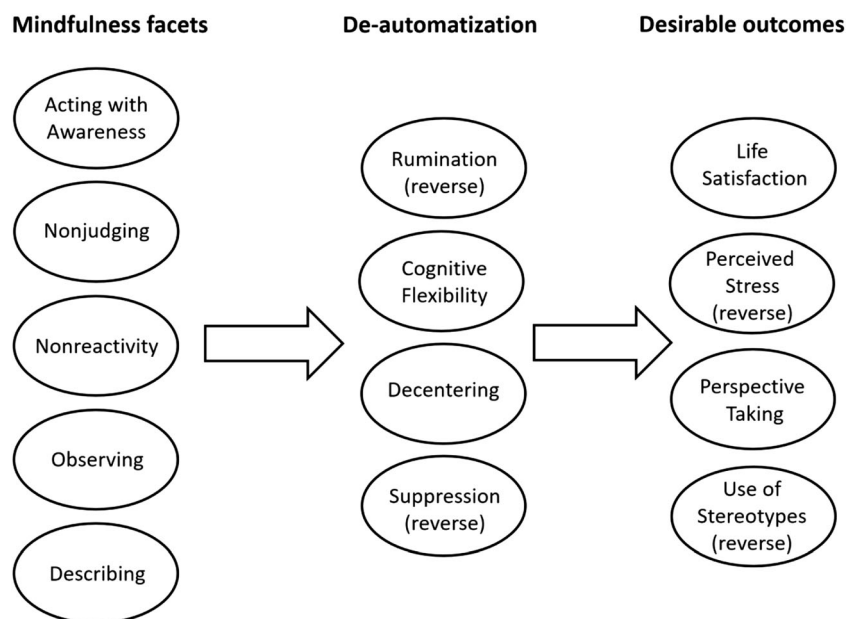
Finally, we tested six models: one with the five mindfulness facets entering the model simultaneously as separate (but

inter-correlated) predictors, the other five having each of the five mindfulness facets—without controlling for the other ones—as a single predictor. The full model was the main analysis, whereas the single-facet models were performed as robustness checks and for exploratory purposes. In all the models, correlations between mediators and between outcomes were always estimated. Parameters were estimated using maximum likelihood estimation, and missing data were handled using full information maximum likelihood. To identify mediating processes, a bias-corrected bootstrapping procedure (Preacher and Hayes 2008) with 10,000 resamples was conducted for all the models tested. The effects in each model were assessed by calculating the 95% confidence intervals for the unstandardized effects, to test their statistical significance, and effect sizes were evaluated based on standardized estimates, as they are less biased and more efficient than proportion and ratio effect sizes (Miočević et al. 2018).

### Results

First, Pearson correlations between the aggregated scores of the variables of the study were calculated: results (together with means and standard deviations) are reported in Table 2. Then, the six models mentioned before were tested. Following the thresholds indicated by Hu and Bentler (1999), the goodness of fit indexes suggested good correspondence between the model and the data both in in the full model (RMSEA = 0.04; SRMR = 0.04; CFI = 0.96; TLI = 0.95) and in single-facet models (RMSEA = 0.04; 0.03 ≤ SRMR ≤ 0.04; 0.97 ≤ CFI ≤ 0.98; TLI = 0.97). Moreover, in all the models, all the

**Fig. 1** Hypothesized effects of mindfulness facets on well-being and social outcomes through de-automatization mediators



**Table 1** Fit indexes derived from confirmatory factor analysis for categorical variables

Scale	Estimator	CFI	TLI	RMSEA	RMR
Acting with awareness facet: unidimensional structure	ULS	0.986	0.980	0.078	0.062
Nonjudging facet: unidimensional structure	ULS	0.991	0.988	0.054	0.046
Nonreactivity facet: unidimensional structure	DWLS	0.998	0.997	0.023	0.023
Observing facet: unidimensional structure	ULS	0.990	0.986	0.044	0.039
Describing facet: unidimensional structure*	ULS	0.998	0.997	0.030	0.029
Five Facet Mindfulness Questionnaire: 5-factor structure	DWLS	0.943	0.939	0.082	0.076
Rumination: unidimensional structure*	ULS	0.991	0.988	0.052	0.049
Cognitive flexibility: unidimensional structure*	ULS	0.978	0.970	0.062	0.055
Decentering: unidimensional structure	ULS	0.981	0.976	0.064	0.058
Suppression: unidimensional structure	ULS	0.985	0.983	0.068	0.064
Satisfaction with life: unidimensional structure	ULS	1.00	1.00	0.015	0.019
Perceived stress: unidimensional structure*	ULS	0.991	0.986	0.046	0.040
Perspective taking: unidimensional structure	ULS	0.995	0.993	0.036	0.033

\*With correlated reverse-coded items

standardized factor loadings were significant at  $p < .001$ , and ranged from 0.70 to 0.93.

In the model with all the facets considered together, the cases-to-free parameter ratio was 5.91 (1153/195), while in single-facet models, the ratio was 9.85 (1153/117). Both ratios were below the 10:1 threshold recommended by Kline (2010), but above the 5:1 threshold suggested by Bentler and Chou (1987) in the case of normal and elliptical theory and large factor loadings. As the effect of a low cases-to-parameter ratio on the estimates is less profound than the one of the sample size (Jackson 2003), the size of our sample is likely to compensate the abundance of estimated parameters.

Results of the full model are reported in Table 3 (direct effects) and Table 4 (indirect effects), while the results of the single-facet models are reported in Tables 5 and 6. To evaluate the size of the indirect effects, we relied both on the confidence intervals of unstandardized effects, and on the size of the standardized estimates. As single-facet models were mainly a robustness check and their results mainly replicated the full model, we comment the results of the full model only.

As shown in the top part of Table 3, acting with awareness, nonjudging, and nonreactivity were positively related to life satisfaction and negatively related to perceived stress, whereas observing was positively associated with both life satisfaction and perceived stress. All facets except nonjudging and describing were also positively associated with perspective taking, while no direct effect emerged in the model for stereotypes use.

When controlling for mediators (bottom part of Table 3), most relationships between predictors and outcomes changed, suggesting powerful associations between mediators and outcomes, as well as between mediators and predictors, leading to mediators absorbing the effects of predictors.

Going into details, the positive effects of mindfulness facets on well-being outcomes showed to be partially explained by de-automatization mediators. Results of indirect effects (Table 4)

demonstrated that acting with awareness, nonjudging, and nonreactivity were positively associated with life satisfaction through the effects of higher cognitive flexibility and decentering, and lower suppression. Observing and describing were positively associated with satisfaction with life via higher cognitive flexibility and decentering.

Consistent with what found for life satisfaction, acting with awareness, nonjudging, and nonreactivity were negatively associated with perceived stress via all de-automatization mediators, namely higher cognitive flexibility and decentering, lower rumination, and suppression. Describing and observing were negatively related to stress via higher cognitive flexibility and decentering, but observing was also positively related to perceived stress via higher rumination.

Compared to well-being paths, social outcome paths had weaker indirect effects and were often characterized by indirect-only mediations, in which the direct effect is not statistically significant, but the mediator is identified consistent with the hypothesized theoretical framework (Zhao et al. 2010). In particular, acting with awareness, nonjudging (in an indirect-only mediation), and nonreactivity were related to perspective taking both in a positive way, through the effect of higher cognitive flexibility and to a lesser extent higher decentering, and in a negative way, through the effect of lower rumination. This last effect was due to the positive association between rumination and perspective taking (Table 3). Consistently, observing was positively related to perspective taking through both higher rumination and higher cognitive flexibility. Describing was associated with perspective taking only through the positive effect of cognitive flexibility.

Lastly, acting with awareness, nonjudging, and nonreactivity showed a negative relationship with stereotype use via lower thought suppression in indirect-only mediations, suggesting that the negative association between mindfulness and stereotyping is entirely due to a more open and accepting attitude toward one's own thoughts.

**Table 2** Means, standard deviations, and Pearson correlations between aggregate scores of the variables of the study

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Acting with awareness	3.59 (0.78)											
2. Nonjudging	3.35 (0.79)	0.43***										
3. Nonreactivity	2.84 (0.61)	0.07*	0.14***									
4. Observing	3.15 (0.73)	-0.06*	-0.17***	0.21***								
5. Describing	3.32 (0.76)	0.31***	0.19***	0.22***	0.27***							
6. Rumination	4.48 (1.12)	-0.35***	-0.49***	-0.28***	0.17***	-0.17***						
7. Cognitive flexibility	4.07 (0.72)	0.33***	0.26***	0.38***	0.28***	0.46***	-0.26***					
8. Decentering	3.12 (0.66)	0.29***	0.31***	0.49***	0.16***	0.31***	-0.40***	0.55***				
9. Suppression	3.18 (0.85)	-0.41***	-0.53***	-0.24***	0.07*	-0.23***	0.62***	-0.29***	-0.37***			
10. Satisfaction with life	4.20 (1.32)	0.26***	0.29***	0.21***	0.12***	0.21***	-0.26***	0.46***	0.48***	-0.33***		
11. Perceived Stress	2.03 (0.68)	-0.36***	-0.46***	-0.35***	0.06*	-0.24***	0.54***	-0.41***	-0.55***	0.58***	-0.45***	
12. Perspective taking	3.57 (0.67)	0.12***	0.03	0.16***	0.23***	0.18***	0.02	0.28***	0.21***	0.15***	-0.09**	
13. Use of stereotypes	3.47 (1.50)	0.02	-0.04	0.01	-0.04	-0.02	0.02	0.03	0.07*	0.02	0.03	-0.14***

M, mean; SD, standard deviation; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

**Table 3** Direct effects of the de-automatization model (latent variable models, unstandardized effects, 95% CI)

Predictors	Rumination	Cognitive flexibility	Decentering	Suppression	Satisfaction with life	Perceived stress	Perspective taking	Use of stereotypes
<b>Mindfulness facets only</b>								
Acting with awareness	-.22 (-.32, -.13)	.14 (.09, .20)	.13 (.07, .18)	-.19 (-.26, -.13)	.24 (.13, .34)	-.15 (-.22, -.08)	.08 (.01, .15)	.08 (-.07, .23)
Nonjudging	-.53 (-.64, -.42)	.13 (.07, .19)	.15 (.09, .21)	-.46 (-.54, -.39)	.35 (.23, .48)	-.33 (-.41, -.26)	.02 (-.06, .09)	-.16 (-.33, .01)
Nonreactivity	-.67 (-.83, -.52)	.37 (.28, .46)	.62 (.52, .72)	-.30 (-.41, -.19)	.33 (.18, .51)	-.50 (-.61, -.39)	.11 (.01, .21)	.11 (-.11, .35)
Observing	.27 (.17, .37)	.17 (.11, .24)	.07 (.01, .13)	.03 (-.04, .09)	.25 (.13, .37)	.09 (.02, .16)	.21 (.14, .28)	-.13 (-.29, .03)
Describing	-.02 (-.13, .08)	.24 (.17, .30)	.06 (.01, .12)	-.04 (-.11, .03)	.02 (-.09, .13)	-.05 (-.13, .02)	.06 (-0.01, 0.13)	-.05 (-.21, .10)
<b>Mindfulness facets and mediators</b>								
Acting with awareness	-	-	-	-	.04 (-.06, .14)	-.02 (-.08, .04)	.06 (-.02, .13)	-.08 (-.08, .24)
Nonjudging	-	-	-	-	.12 (.01, .25)	-.10 (-.17, -.02)	.02 (-.07, .10)	-.11 (-.31, .09)
Nonreactivity	-	-	-	-	-.31 (-.52, -.10)	-.12 (-.23, -.01)	.04 (-.12, .19)	-.03 (-.30, .35)
Observing	-	-	-	-	.11 (-.00, .22)	.11 (.04, .18)	.15 (.07, .22)	-.16 (-.33, .01)
Describing	-	-	-	-	-.15 (-.26, -.05)	.02 (-.04, .08)	.00 (-.07, .08)	-.09 (-.25, .08)
Rumination	-	-	-	-	.04 (-.06, .15)	.07 (.01, .12)	.09 (.03, .16)	-.04 (-.19, .11)
Cognitive flexibility	-	-	-	-	.53 (.33, .72)	-.14 (-.24, -.04)	.22 (.10, .35)	.13 (-.16, .41)
Decentering	-	-	-	-	.69 (.50, .87)	-.34 (-.44, -.24)	0.07 (-.07, .20)	.15 (-.15, .44)
Suppression	-	-	-	-	-.21 (-.34, -.08)	.28 (.21, .35)	-.02 (-.11, .06)	.24 (.04, .43)

Statistically significant effects (in italics) determined by 95% bias-corrected bootstrapped confidence interval (10,000 bootstrapped samples)

**Table 4** Indirect effects of mindfulness facets on well-being and social outcomes through de-automatization mediators (latent variable model)

Predictors	Indirect effects	Satisfaction with Life		Perceived Stress			Perspective Taking			Use of Stereotypes			
		<i>IE</i>	95% CI <i>IE</i>	<i>Std IE</i>	<i>IE</i>	95% CI <i>IE</i>	<i>Std IE</i>	<i>IE</i>	95% CI <i>IE</i>	<i>Std IE</i>	<i>IE</i>	95% CI <i>IE</i>	<i>Std IE</i>
Acting with awareness	Total indirect	.20	(.13, .27)	.14	.13	(-.18, -.09)	-.15	.02	(-.01, .06)	.03	.00	(-.06, .06)	.00
	Via: Rumination	-.01	(-.04, .01)	-.01	-.01	(-.03, -.00)	-.02	-.02	(-.04, -.01)	-.03	.01	(-.02, .05)	.01
	Cognitive flexibility	.08	(.04, .13)	.05	-.02	(-.04, -.01)	-.02	.03	(.01, .06)	.04	.02	(-.02, .06)	.01
	Decentering	.09	(.05, .14)	.06	-.04	(-.07, -.02)	-.05	.01	(-.01, .03)	.01	.02	(-.02, .07)	.01
	Suppression	.04	(.02, .07)	.03	-.05	(-.08, -.03)	-.06	.00	(-.01, .02)	.01	-.05	(-.09, -.01)	-.03
Nonjudging	Total indirect	.24	(.16, .33)	.17	-.23	(-.29, -.18)	-.26	-.00	(-.05, .05)	.00	-.05	(-.15, .05)	-.03
	Via: Rumination	-.02	(-.08, .03)	-.02	-.03	(-.07, -.01)	-.04	-.05	(-.09, -.01)	-.06	.02	(-.06, .11)	.01
	Cognitive flexibility	.07	(.03, .12)	.05	-.02	(-.04, -.01)	-.2	.03	(.01, .06)	.04	.02	(-.02, .06)	.01
	Decentering	.10	(.06, .16)	.7	-.05	(-.08, -.03)	-.06	.01	(-.01, .03)	.01	.02	(-.02, .07)	.01
	Suppression	.10	(.04, .16)	.07	-.13	(-.17, -.09)	-.14	.01	(-.03, .05)	.01	-.11	(-.21, -.02)	-.06
Nonreactivity	Total indirect	.65	(.50, .83)	.31	-.39	(-.48, -.31)	-.29	.07	(-.02, .16)	.05	.09	(-.09, .28)	.03
	Via: Rumination	-.03	(-.10, .04)	-.01	-.04	(-.08, -.01)	-.03	-.06	(-.12, -.02)	-.05	.03	(-.07, .14)	.01
	Cognitive flexibility	.19	(.12, .29)	.09	-.05	(-.09, -.01)	-.04	.08	(.03, .14)	.07	.05	(-.06, .16)	.02
	Decentering	.43	(.30, .57)	.20	-.21	(-.29, -.14)	-.16	.04	(-.05, .12)	.03	.09	(-.09, .28)	.03
	Suppression	.06	(.02, .11)	.03	-.08	(-.13, -.05)	-.06	.01	(-.02, .03)	.01	-.07	(-.15, -.02)	-.03
Observing	Total indirect	.15	(.08, .22)	.10	-.02	(-.07, .02)	-.03	.07	(.04, .10)	.08	0.03	(-.04, .09)	.02
	Via: Rumination	.01	(-.01, .04)	.01	.02	(.01, .04)	.02	.03	(.01, .05)	.03	-.01	(-.06, .03)	-.01
	Cognitive flexibility	.09	(.05, .14)	.06	-.02	(-.05, -.01)	-.03	.04	(.02, .07)	.05	.02	(-.03, .08)	.01
	Decentering	.05	(.01, .09)	.03	-.02	(-.05, -.01)	-.03	.00	(-.00, .02)	.01	.01	(-.01, .05)	.01
	Suppression	-.01	(-.03, .01)	.00	.01	(-.01, .03)	.01	-.00	(-.01, .00)	-.00	.01	(-.01, .03)	.00
Describing	Total indirect	.18	(.10, .26)	.12	-.07	(-.12, -.02)	-.08	.06	(.03, .09)	.07	.03	(-.04, .10)	.02
	Via: Rumination	.00	(-.01, .00)	.00	-.00	(-.01, .00)	-.00	-.00	(-.02, .01)	.00	.00	(-.01, .02)	.00
	Cognitive flexibility	.13	(.08, .19)	.09	-.03	(-.06, -.01)	-.04	.05	(.02, .09)	.07	.03	(-.04, .10)	.02
	Decentering	.04	(.01, .09)	.03	-.02	(-.05, -.01)	-.02	.00	(-.00, .02)	.01	.01	(-.01, .04)	.01
	Suppression	.01	(-.00, .03)	.01	-.01	(-.03, .01)	-.01	.00	(-.00, .01)	.00	-.01	(-.04, .00)	-.01

Statistically significant effects (in italics) determined by 95% bias-corrected bootstrapped confidence interval (10,000 bootstrapped samples). *IE*, unstandardized indirect effect; 95% CI *IE* = 95% confidence interval of unstandardized indirect effect; *Std IE* = standardized indirect effect

Overall, de-automatization appeared as a relevant channel of the effects of mindfulness facets on well-being outcomes, more than social outcomes. Effect sizes were substantially similar for the indirect effects of acting with awareness, nonjudging, and nonreactivity, except for the stronger mediation effect of decentering in the relationships between nonreactivity and well-being variables, while they were weaker for describing. Observing interestingly showed mixed results, in terms of simultaneously positive and negative indirect associations with perceived stress, and a positive relationship with perspective taking via higher rumination, hence lower de-automatization.

**Discussion**

Relying on the de-automatization model by Kang et al. (2013), we hypothesized and tested a mediation model in which higher cognitive flexibility and decentering, and lower rumination and thought suppression, mediated the relationships between dispositional mindfulness facets and well-being and social outcomes. This model was tested in a large sample, relying on structural

equation modeling, and specific mediational paths empirically supported the de-automatization theoretical framework.

Mediational paths were quite similar for well-being outcomes (life satisfaction and perceived stress): cognitive flexibility and decentering, and to a smaller extent suppression, mediated the relationships between mindfulness facets and the two well-being outcomes, while rumination had a mediational role only in the model for perceived stress. These results suggest that the well-being benefits of dispositional mindfulness are partly conveyed by a reduction in maladaptive automatized cognitive processes, such as rigid thinking schemes and automatic immersion in one’s thoughts. In particular, dispositional mindfulness seems able to instigate more flexible thinking patterns and a dis-identification from the content of thoughts, which in turn may help individuals cope with stressful situations, and preserve their well-being.

These findings are consistent with the model on the mechanisms of mindfulness by Shapiro et al. (2006), in which decentering or re-perceiving was the main mediator between mindfulness and mental health outcomes (e.g., Brown et al. 2015), and with research showing that the ability to see thoughts and feelings as transient mental states, without over-identifying



**Table 5** Direct effects of the five de-automatization models with FFMQ facets as single predictors (latent variable models)

Predictors	Rumination	Cognitive flexibility	Decentering	Suppression	Satisfaction with life	Perceived stress	Perspective taking	Use of stereotypes
<b>Mindfulness facets only</b>								
Acting with awareness	-.56 (-.64, -.47)	.29 (.24, .35)	.26 (.20, .31)	-.45 (-.51, -.39)	.41 (.32, .50)	-.37 (-.43, -.31)	.09 (.04, .15)	.01 (-.11, .13)
Nonjudging	-.79 (-.88, -.70)	.27 (.21, .33)	.29 (.24, .36)	-.61 (-.68, -.55)	.47 (.38, .57)	-.50 (-.57, -.43)	.04 (-.02, .10)	-.09 (-.22, .04)
Nonreactivity	-.79 (-.99, -.62)	.60 (.50, .71)	.73 (.63, .85)	-.48 (-.61, -.35)	.58 (.42, .75)	-.61 (-.74, -.49)	.22 (.12, .32)	.01 (-.19, .23)
Observing	.27 (.17, .39)	.28 (.22, .34)	.15 (.09, .21)	.07 (-.00, .14)	.23 (.12, .33)	.06 (-.01, .13)	.24 (.17, .30)	-.10 (-.24, .03)
Describing	-.24 (-.34, -.14)	.44 (.38, .50)	.28 (.22, .34)	-.25 (-.32, -.17)	.33 (.23, .42)	-.24 (-.31, -.17)	.18 (.12, .24)	-.08 (-.21, .05)
<b>Mindfulness facets and mediators</b>								
Acting with awareness	-	-	-	-	.07 (-.02, .16)	-.04 (-.09, .01)	.03 (-.03, .10)	.06 (-.08, .21)
Rumination	-	-	-	-	.07 (-.02, .16)	.12 (.07, .17)	.12 (.06, .18)	-.07 (-.20, .07)
Cognitive flexibility	-	-	-	-	.45 (.28, .61)	-.10 (-.18, -.01)	.30 (.19, .41)	.00 (-.24, .24)
Decentering	-	-	-	-	.59 (.42, .74)	-.37 (-.47, -.28)	.10 (-.01, .22)	.14 (-.12, .39)
Suppression	-	-	-	-	-.23 (-.35, -.11)	.30 (.23, .37)	-.04 (-.11, .05)	.29 (.10, .46)
Nonjudging	-	-	-	-	.13 (.01, .25)	-.11 (-.18, -.05)	-.01 (-.09, .07)	-.05 (-.23, .13)
Rumination	-	-	-	-	.09 (-.01, .18)	.10 (.05, .15)	.12 (.05, .18)	-.08 (-.22, .06)
Cognitive flexibility	-	-	-	-	.45 (.29, .61)	-.10 (-.18, -.02)	.31 (.21, .41)	.02 (-.21, .26)
Decentering	-	-	-	-	.58 (.42, .74)	-.37 (-.47, -.28)	.10 (-.02, .22)	.14 (-.12, .39)
Suppression	-	-	-	-	-.21 (-.33, -.08)	.27 (.20, .34)	-.05 (-.13, .04)	.25 (.06, .44)
Nonreactivity	-	-	-	-	-.32 (-.54, -.12)	-.06 (-.17, .05)	.06 (-.09, .20)	-.04 (-.34, .27)
Rumination	-	-	-	-	.04 (-.05, .13)	.12 (.07, .17)	.12 (.06, .18)	-.08 (-.21, .06)
Cognitive flexibility	-	-	-	-	.50 (.34, .67)	-.10 (-.19, -.02)	.30 (.20, .41)	.02 (-.21, .26)
Decentering	-	-	-	-	.72 (.53, .90)	-.35 (-.46, -.25)	.08 (-.06, .21)	.15 (-.14, .44)
Suppression	-	-	-	-	-.25 (-.37, -.13)	.31 (.25, .38)	-.05 (-.12, .03)	.27 (.09, .44)
Observing	-	-	-	-	.01 (-.09, .11)	.12 (.06, .18)	.14 (.07, .21)	-.16 (-.32, -.01)
Rumination	-	-	-	-	.06 (-.04, .15)	.09 (.04, .14)	.08 (.02, .14)	-.03 (-.17, .12)
Cognitive flexibility	-	-	-	-	.45 (.29, .62)	-.16 (-.25, -.07)	.25 (.14, .36)	.08 (-.17, .33)
Decentering	-	-	-	-	.59 (.42, .74)	-.39 (-.49, -.30)	.18 (-.04, .19)	.17 (-.09, .42)
Suppression	-	-	-	-	-.25 (-.37, -.14)	.31 (.25, .38)	-.04 (-.12, .03)	.26 (.09, .44)
Describing	-	-	-	-	-.13 (-.23, -.03)	.04 (-.02, .10)	.05 (-.02, .12)	-.11 (-.27, .05)
Rumination	-	-	-	-	.06 (-.03, .16)	.12 (.08, .17)	.12 (.06, .18)	-.07 (-.20, .07)
Cognitive flexibility	-	-	-	-	.55 (.37, .73)	-.14 (-.23, -.04)	.28 (.16, .40)	.08 (-.19, .35)
Decentering	-	-	-	-	.59 (.42, .74)	-.37 (-.47, -.28)	.10 (-.01, .22)	.14 (-.12, .39)
Suppression	-	-	-	-	-.27 (-.39, -.15)	.32 (.25, .38)	-.04 (-.12, .04)	.26 (.08, .43)

Statistically significant effects (in italics) determined by 95% bias-corrected bootstrapped confidence interval (10,000 bootstrapped samples)

**Table 6** Indirect effects of the five de-automatization models with FFMQ facets as single predictors (latent variable models)

Predictors	Indirect effects	Satisfaction with life		Perceived stress			Perspective taking			Use of stereotypes			
		<i>IE</i>	95% CI <i>IE</i>	<i>Std IE</i>	<i>IE</i>	95% CI <i>IE</i>	<i>Std IE</i>	<i>IE</i>	95% CI <i>IE</i>	<i>Std IE</i>	<i>IE</i>	95% CI <i>IE</i>	<i>Std IE</i>
Acting with awareness	Total indirect	.35	(.28, .42)	.25	-.32 (-.37, -.28)	-.38	.06	(.02, .11)	.08	-.06 (-.14, .02)	-.03		
	Via: Rumination	-.04	(-.09, .01)	-.03	-.07 (-.10, -.04)	-.08	-.07	(-.11, -.03)	-.09	.04 (-.04, .11)	.02		
	Cognitive flexibility	.13	(.08, .19)	.09	-.03 (-.06, -.01)	-.03	.09	(.05, .13)	.11	.00 (-.07, .07)	.00		
	Decentering	.15	(.10, .21)	.11	-.10 (-.13, -.07)	-.11	.03	(-.00, .06)	.03	.04 (-.03, .11)	.02		
Nonjudging	Suppression	.11	(.05, .16)	.08	-.14 (-.17, -.10)	-.16	.02	(-.02, .05)	.02	-.13 (-.21, -.04)	-.07		
	Total indirect	.35	(.26, .44)	.24	-.38 (-.44, -.32)	-.42	.05	(-.01, .11)	.06	-.04 (-.16, .07)	-.02		
	Via: Rumination	-.07	(-.15, .01)	-.05	-.08 (-.12, -.04)	-.09	-.09	(-.14, -.04)	-.11	.07 (-.05, .18)	.04		
	Cognitive flexibility	.12	(.07, .18)	.08	-.03 (-.05, -.01)	-.03	.08	(.05, .12)	.10	.01 (-.06, .07)	.00		
Nonreactivity	Decentering	.17	(.12, .24)	.12	-.11 (-.15, -.08)	-.12	.03	(-.00, .07)	.04	.04 (-.03, .12)	.02		
	Suppression	.13	(.05, .21)	.09	-.17 (-.21, -.12)	-.18	.03	(-.02, .08)	.04	-.15 (-.27, -.04)	-.08		
	Total indirect	.92	(.75, 1.12)	.42	-.56 (-.68, -.46)	-.42	.16	(.07, .26)	.13	.06 (-.13, .24)	.02		
	Via: Rumination	-.03	(-.10, .04)	-.01	-.09 (-.14, -.06)	-.07	-.10	(-.16, -.05)	-.08	.06 (-.05, .18)	.02		
Observing	Cognitive flexibility	.30	(.20, .43)	.14	-.06 (-.11, -.01)	-.05	.18	(.12, .26)	.15	.01 (-.13, .16)	.01		
	Decentering	.53	(.38, .69)	.24	-.26 (-.35, -.18)	-.19	.06	(-.04, .15)	.05	.11 (-.10, .33)	.04		
	Suppression	.12	(.06, .20)	.06	-.15 (-.21, -.10)	-.11	.02	(-.02, .06)	.02	-.13 (-.23, -.04)	-.05		
	Total indirect	.22	(.14, .29)	.15	-.06 (-.12, .00)	-.07	.10	(.07, .14)	.13	.06 (-.02, .14)	.03		
Describing	Via: Rumination	.02	(-.01, .05)	.01	.03 (.01, .05)	.03	.02	(.01, .04)	.03	-.01 (-.05, .03)	-.00		
	Cognitive flexibility	.13	(.08, .19)	.09	-.05 (-.07, -.02)	-.05	.07	(.04, .11)	.09	.02 (-.05, .10)	.01		
	Decentering	.09	(.05, .14)	.06	-.06 (-.09, -.04)	-.07	.01	(-.01, .03)	.02	.03 (-.01, .08)	.01		
	Suppression	-.02	(-.04, -.00)	-.01	.02 (-.00, .05)	.02	-.00	(-.01, .00)	-.00	.02 (.00, .05)	.01		
Describing	Total indirect	.45	(.37, .55)	.31	-.27 (-.33, -.21)	-.30	.13	(.09, .18)	.17	.03 (-.06, .12)	.02		
	Via: Rumination	-.02	(-.04, .01)	-.01	-.03 (-.05, -.02)	-.03	-.03	(-.05, -.01)	-.03	.02 (-.02, .05)	.01		
	Cognitive flexibility	.24	(.16, .33)	.17	-.06 (-.10, -.02)	-.07	.12	(.07, .18)	.15	.04 (-.08, .16)	.02		
	Decentering	.16	(.11, .23)	.11	-.10 (-.14, -.07)	-.12	.03	(-.00, .06)	.04	.04 (-.03, .12)	.02		
Describing	Suppression	.07	(.03, .11)	.05	-.08 (-.11, -.05)	-.09	.01	(-.01, .03)	.01	-.06 (-.12, -.02)	-.03		

Statistically significant effects (in italics) determined by 95% bias-corrected bootstrapped confidence interval (10,000 bootstrapped samples). *IE* = unstandardized indirect effect; 95% CI *IE* = 95% confidence interval of unstandardized indirect effect; *Std IE* = standardized indirect effect

with them, is related to a shift in perspective reducing perceived stress (Lebois et al. 2015). Moreover, the focus on the present characterizing mindful attention may also help the mind not wander on topics that are irrelevant to the present moment (Mrazek et al. 2013): present-focused thoughts predict improvements in life satisfaction over time, by reducing negative rumination (Felsman et al. 2017).

However, this pattern of results mainly concerns the acting with awareness, nonjudging, and nonreactivity facets. Indirect effects were weaker for describing, while observing showed mixed results: despite being positively related to life satisfaction, cognitive flexibility, and decentering, it also had positive relationships with perceived stress and rumination, then leading to an indirect effect on stress via higher rumination. Consistent with research showing that observing in non-meditators can be related to anger, rumination, controlling, and judgmental tendencies (Bergomi et al. 2013; Peters et al. 2015), our results suggest that observing may have both positive and negative sides that prevent de-automatization to completely mature. In particular, people scoring higher on observing may tend to be less able to inhibit

elaborative processing, resulting in overthinking about negative events, which then may be perceived as more stressful.

Compared with well-being outcomes, mediational paths were weaker for social outcomes, and sometimes characterized by indirect-only mediations. As we found in the models on well-being variables, the facets acting with awareness, nonjudging, and nonreactivity showed a similar pattern. All the three had mixed relationships with perspective taking: positive via higher cognitive flexibility (which was also found for describing), and negative via lower rumination. This finding suggests that the individual tendency to take a decentered perspective on events and situations may not favor taking the perspective of the others, which instead may be positively related to cognitive flexibility, and to the tendency to think back to what has been done or said, as also suggested by the positive association between rumination and perspective taking. Hence, the positive channel via cognitive flexibility, the negative channel via rumination, and the absence of indirect—and direct—effects via decentering. This finding is consistent with a previous study showing positive and reciprocal relationships between rumination and empathy (Boyraz and

Waits 2015), and offers a partial explanation for why associations between mindfulness and empathy are usually weak (e.g., Dekeyser et al. 2008): a detached perspective, together with a non-overthinking attitude, may be related to milder empathic reactions.

On the other hand, and consistent with past research on the links between observing and rumination (Peters et al. 2015), and between observing and empathy (Dekeyser et al. 2008), the observing facet was positively related to perspective taking via both higher rumination and higher cognitive flexibility. A careful attending to external and internal events seems to help take the perspective of the others, via more intense, but also more flexible, thinking.

Finally, the indirect-only mediational paths from mindfulness to use of stereotypes showed a mediation effect of suppression for the facets acting with awareness, nonjudging, nonreactivity, and to some extent describing. This finding suggests that dysfunctional automatic thinking (e.g., “I have thoughts that I cannot stop”, from the WBSI) may be a vehicle for stereotyping, and a channel between the negative relationship between dispositional mindfulness and use of stereotypes, already found in past research (Lueke and Gibson 2015; Tincher et al. 2016).

## Limitations and Future Research

We have to acknowledge limitations in this study. First, we employed a nonrepresentative convenience sample of Italian respondents, and thus, our findings may not be completely generalizable to the population. Second, we used only self-report measures, which may be biased by individuals' responding tendencies; however, as the most appropriate way to measure dispositions is by using validated scales, a replication with behavioral measures could complement, but not substitute, the current study, by shedding light on a non-dispositional version of the de-automatization model. Third, our data are cross-sectional, so conclusions about the direction of the associations between the variables cannot be drawn; nonetheless, time differences in dispositional variables are more likely to be due to some sort of noise, than to a true change, so a longitudinal study could not be able to solve the causality issue. Future studies could try to test the de-automatization model with experiments.

To conclude, the de-automatization model found support in our empirical operationalization especially for what concerned individual-oriented, more than social-oriented outcomes. This suggests that the association between dispositional mindfulness and mental health may be partially explained by a reduction in those automatized cognitive processes that have become maladaptive, with people becoming conscious of—but not overwhelmed by—their own mental processes, and gaining control over them. Conversely, only some features of de-automatization positively contribute to social outcomes.

**Author Contributions** GF conceptualized the research questions, designed the study, conducted data analyses, and wrote the first draft of the paper. AV conceptualized the research questions, designed the study, supervised the data collection, assisted with data analysis, and edited the paper.

## Compliance with Ethical Standards

**Conflict of Interest** The authors declare that they have no conflicts of interest.

**Ethical Standards** The manuscript does not contain clinical studies or patient data. The study procedure was in accordance with the 1964 Helsinki Declaration and its later amendments, or comparable ethical standards, and was approved by the Ethical Committee for Psychological Research of the University of Padova, protocol number 3144. Informed consent was obtained from all participants.

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