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Predictive value of psychological resilience for mental health disturbances: A three-wave prospective study among police officers

Summary

Psychological resilience is considered an important predictor for mental health disturbances among rescue workers. To what extent resilience predicts mental health disturbances among police officers at different stages while adjusting for existing (mental) health disturbances is unclear. Among 566 police officers resilience was operationalized by the Resilience Scale-nl and the Mental Toughness Questionnaire-48 questionnaires (8 scales in total). Mental health disturbances (such as depression symptoms and PTSD) and other health-related variables were assessed at baseline and follow-ups at three and nine months. Hierarchical logistic regression analyses assessed the predictive values of the 8 resilience scales for mental health disturbances at baseline (n = 566), three months (n = 566) and nine months (n = 364), adjusted for demographics, work circumstances, and health-related factors at baseline. Seven of the eight resilience scales at baseline were cross sectional associated with mental health disturbances at baseline. Only four scales were independent predictors for mental health disturbances at three months. When examining mental health disturbances at nine months, only one resilience scale remained a significant predictor. In sum, psychological resilience

has a declining protective capacity for mental health disturbances over a medium time-span, specifically when corrected for baseline mental health disturbances.

Introduction

The resilience concept has been described in many different manners (Aburn et al., 2016; Britt et al., 2016; McGeary, 2011; Windle, 2011), but is generally defined as either a process, an outcome or a personal capacity (Britt et al., 2016; Fletcher and Sarkar, 2013). In its early form resilience was mostly considered to be a trait, or trait-like characteristic (Kobasa, 1979; Luthans et al., 2006). However, the interplay of the individual with his/her environment was recognized as the process that constitutes resilience, shifting the concept away from solely residing in individuals and being a characteristic individuals are born with (Rutter, 1993; Pangallo et al., 2015). Moreover, resilience was considered to be changeable, either by exposure to adversity or by aimed interventions (Britt et al., 2016; Rutter, 1993).

To date still many approaches to conceptualizing and operationalizing psychological resilience make the assessment and comparability complex across studies (Britt et al., 2016; McGeary, 2011; Meredith et al., 2011; Paton et al., 2008; Luthar et al., 2000; Windle et al., 2011). Given the lack of consensus on definitional and measurement issues in the literature, it is important that any study clearly states which type of definition and measurement is used in the current study. In the current paper, we decided to use an approach that, in line with previous empirical studies among police officers, views resilience as an individuals' capacity to mitigate stress levels caused by circumstances that are likely to induce stress, such as potentially traumatic experiences. Exhibiting resilient behaviors prior to potentially stressful events protects individuals from adverse outcomes after these experiences. In other words, resilience could be considered a psychological resource that allows individuals to adapt well in the face of adversity (Hobfoll, 1989; Waugh et al., 2008).

In research, psychological resilience as a personal characteristic is often operationalized by instruments that contain multiple dimensions that together provide a measure of the degree of the general construct. The review of Pangallo et al. (2015) examined

factors within several psychological resilience measurement instruments, and found 9 themes and 16 subthemes that are considered part of the overarching psychological resilience construct as a personal capacity. Among the subthemes are flexibility, acceptance, control, self-efficacy, commitment, and social competence as capacities (Pangallo et al., 2015). Among the most applied dimensions are Challenge, Control and Commitment, as found in the Mental Toughness Questionnaire 48 (MTQ-48) by Clough et al., (2007) and the widely used Dispositional Resilience Scale (DRS) by Bartone et al. (1989). Another example is Personal competence, conform to the Resilience Scale (Wagnild and Young, 1993) and the Connor-Davidson Resilience Scale (CD-RISC; Connor and Davidson, 2003). However, the theoretical argument is always similar: the presence of these characteristics in an individual is hypothesized to determine his/her capacity to mitigate stress levels caused by circumstances that are likely to induce stress, such as potentially traumatic experiences. Furthermore, exhibiting resilient behaviors prior to potentially stressful events protects individuals from adverse outcomes after these experiences. In other words, resilience could be considered a psychological resource that allows individuals to adapt well in the face of adversity (Hobfoll, 1989; Waugh et al., 2008). The use of the concept is often loaded with an implicit connotation of mentally strong individuals, which is also implied by terms such as hardiness and mental toughness. Among others, physical health (e.g. Taft et al., 1999), social functioning (e.g. Elbogen et al., 2014), and increased performance (e.g. Simpson et al., 2006) are found to be associated with psychological resilience in cross-sectional studies.

However, most studies assessed the associations between psychological resilience and general or specific mental health problems. Cross-sectional studies among paramedics, police officers, firefighters, and soldiers found that resilience was associated with high general mental health (Taylor, 2013), low post-traumatic stress disorder (PTSD; Lee et al., 2014; McCanlies et al., 2014; Streb et al., 2014; Zakin et al., 2003), low anxiety (Zakin et al.,

2003), low depression (Youssef et al., 2013; Zakin et al., 2003), low somatization (Schaubroeck et al., 2011; Zakin et al., 2003), high positive and low negative affectivity (Maguen et al., 2008), low alcohol use (Gabriel et al., 2015), low psychoactive substance use (Teichman and Cohen, 2012), low burnout (Lo Bue et al., 2013), low violent behavior (Elbogen et al., 2012), and low suicidal behavior (Pietrzak et al., 2011). How informative these cross-sectional studies may be, in order to more firmly establish the protective qualities of psychological resilience in employees, longitudinal studies are needed, including baseline corrections of pre-existing mental health issues (Rona et al., 2009).

Resilience is deemed important in rescue work occupations, as they expose their employees on a frequent basis to stressful and potentially traumatic events (PTE) that may negatively impact their mental well-being. Police officers are exposed to stressful experiences far more frequent than most members of society, such as violence, accidents, sexual abuse, threat, and confrontation with injured of dead children. Therefore, law enforcement is an occupation that requires individuals, among others, to be resilient (de la Vega et al., 2013; Elliot et al., 2015; Garbarino et al., 2013; McCanlies et al., 2014; Miller, 2008).

To the best of our knowledge only four longitudinal studies among aforementioned groups explicitly corrected for baseline levels of mental health or history of mental health, when assessing the independent predictive value of resilience for mental health problems. Thomassen et al. (2015) assessed to what extent hardiness predicted general mental health from pre-deployment until mid-deployment (three-month period) above baseline general mental health scores, among soldiers. Baseline hardiness no longer predicted follow-up general mental health when baseline general mental health was controlled for. Three other studies, analyzing the specific mental health outcomes of depression (Dolan and Adler, 2006; Wild et al., 2016), suicidal behavior (Youssef et al., 2013) and PTSD (Wild et al., 2016), showed similar results. The first study examined predictors of major depression or PTSD

episodes in paramedics over a two-year span, while correcting for psychiatric history. Lower scores on the CD-RISC were not predictive of PTSD episodes. However, the likeliness of experiencing an episode of major depression slightly, but significantly, increased when CD-RISC scores decreased (OR = 0.96). The second study found a significant effect of the CD-RISC on follow-up suicidal behavior (approximately three years later) while controlling for, among others, baseline suicidal behavior among 176 war veterans. However, the corresponding partial *r*-squared of psychological resilience was 0.01, while the baseline measurement of suicidality was 0.09 (Youssef et al., 2013). The third study among a large group of veterans returning from overseas deployment corrected for baseline depression and found that this variable was predictive of four to five month follow-up depression while military hardiness was not. A significant but very small interaction effect of hardiness and deployment stressors was found.

These longitudinal studies question the protective capacity of psychological resilience against the development of mental health problems in high risk occupations, and stand in stark contrast with earlier mentioned cross-sectional studies which reported substantially larger effect sizes. Although some positive results were found in four longitudinal studies, the findings are ambiguous as both significant and non-significant results were found: the effect sizes of psychological resilience effects were never notably substantial. Also, these longitudinal studies were conducted among military samples and a paramedic sample and the characteristics of these professional populations might not be fully generalized to police officers.

To improve our knowledge on the predictive value of psychological resilience, the present three-wave longitudinal study among police officers was conducted. Based on previous studies we hypothesized the following: the predictive value of psychological resilience measures for mental health problems decreases over time, especially when

controlling for mental health problems at baseline. The predictive value of resilience was adjusted for demographic characteristics (age, gender and educational level, cf. Bijl et al., 1998), work circumstances (operational, organizational stressors and job satisfaction, cf. Setti and Argentero, 2013; van der Velden et al., 2010), and health (mental health disturbances, general health and services use). The present study applies the definition of resilience as the psychological resilience as a capacity of individuals to be able to perform well under stressful circumstances and not to develop adverse outcomes afterwards.

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Methods

Participants and procedures

Data for the current study stem from a research project determining the effects of a resilience enhancement training for police officers. Results of this quasi-experimental study were published elsewhere (van der Meulen et al. 2017). The study compared pre-training baseline and three and nine months post-training follow-up measurements of psychological resilience (as measured by the Resilience Scale-nl and the Mental Toughness Questionnaire 48) between an experimental and a control group. The overarching finding was an absence of significant effects indicating that the training did not influence resilience levels and did not influence mental health levels. Because of these negative findings and to increase power, the experimental and control group were combined for all analyses. Nevertheless, in the analyses we controlled for training participation. This study was conducted in 2013.

For the current study, participants that at least participated at baseline and the follow-up at three months were used. Respondents were either recruited through training enrollment, which occurred randomly, or recruited through randomly selecting and contacting police

officers in four police districts in the Netherlands. The majority of the respondents (59.5%) had emergency and enforcement duties (street officers), the remainder had investigative (10.1%), managerial (10.1%), intake & service (5.5%) or support (6.4%) functions, or were still in training (1.2%). 3.0% specified they had 'another' function and 4.2% did not specify their function. In the original study design the experimental group was provided paper and pencil questionnaires, the control group was provided similar questionnaires but in a digital manner. The attrition rate from baseline to follow-up at three months was 51.2% and from three to nine months 35.7%.The original study was approved by the Psychological Ethical Testing Committee of Tilburg University and respondents gave their written informed consent.

Measures

Demographics

Age (in years), gender, and educational level (low, middle and high according to categorization by Statistics Netherlands (Centraal Bureau voor de Statistiek, 2016) were assessed at baseline.

Psychological resilience

Psychological resilience was measured at baseline by two separate instruments: the Resilience Scale-nl (RS-nl) (Portzky et al., 2010; Wagnild and Young, 1993) and the Mental Toughness Questionnaire-48 (MTQ-48) (Clough et al., 2007). The 25-item Resilience Scale-nl is a widely established measure of psychological resilience with excellent psychometric properties (Portzky et al., 2010). The questionnaire contains the subscales of Personal competence, Acceptance of self and life and Dealing with difficult circumstances. Answering options on statements concerning psychological resilience items ranged from 1 (totally disagree) to 5 (totally agree). Dividing the scores for the total score and subscales by the number of items results in a theoretical range of 1 to 5 (Portzky et al., 2010; Wagnild and

Young, 1993). The Cronbach's α's for the RS-nl total scores and subscales of Personal competence, Acceptance of self and life, and Dealing with difficult circumstances were in the current study 0.91, 0.86, 0.77 and 0.76 respectively. The MTQ-48 is a measure of psychological resilience rooted in sports psychology (Clough et al., 2007). Answering options on psychological resilience statements ranged from 1 (totally disagree) to 5 (totally agree), with a theoretical range from 48 to 240. It was used in the original study because training elements were based on insights from sports psychology. The total score and subscales of Challenge, Commitment, and Interpersonal confidence yielded Cronbach's α's of 0.91, 0.73, 0.75 and 0.72 respectively. The remaining subscales of Emotional Control, Life Control, and Confidence in Abilities all yielded insufficient Cronbach's α's of <0.70 and were not used in any analyses.

Scores on all psychological resilience scales were categorized into three equally large low, medium and high scoring groups. This categorization was necessary due to constraints in the parametric properties of all measures of psychological resilience, and therefore prohibiting the use of parametric statistical methods. Kolmogorov-Smirnov tests of normality of all 8 scales yielded consistently highly significant (< 0.001) outcomes. Log-transformation did not reduce the skewness to an acceptable level. The RS-nl total score means and standard deviations of the three equally sized groups were 3.76 ± 0.20, 4.13 ± 0.10 and 4.60 ± 0.20 respectively. For the MTQ-48, these means were 165.49 ± 9.73, 181.77 ± 3.23 and 199.20 ± 10.19 respectively. Means and Sd's for the subscales of low, middle and high group specifications can be obtained from the authors.

Mental health

Mental health problems were measured by the Symptoms Checklist-90-revised (SCL-90-r) (Derogatis et al., 1973) and the Self-Rating Inventory for PTSD (Hovens et al., 2002) at baseline, and follow-ups at three and nine months. The SCL-90-r is a widely used measure of

mental health disturbances. For the current study, the subscales of anxiety (10 items), depression (16 items) and hostility (6 items) were used. Items on experienced symptomology in the last week were scored on a 5 point Likert scales, with answering options ranging from 1 (not at all) to 5 (very much). Adding individual items leads to a total score for anxiety, depression and hostility with higher scores indicating more symptomology (Derogatis et al., 1973). The Cronbach's α's for the individual subscales of anxiety, depression and hostility were 0.78, 0.89 and 0.73 in the current sample. Based on general population norm scores (Arrindell and Ettema, 1986), the total scores for each subscale is divided into to two categories of 1) 'below average/moderate' and 2) 'severe/very severe'. PTSD-symptomatology was examined using the 22-item SRIP with four-point Likert scales (Hovens et al., 2002). The total SRIP score was used to determine probable cases of PTSD, in accordance with Dutch norm tables. Probable PTSD was only measured among officers who experienced a potentially traumatic event up to one year prior to the baseline measurement (n = 399). Cronbach's alpha of the SRIP was 0.97 in the current sample. In the current study mental health disturbances were operationalized as scoring positive PTSD according to the SRIP or having a 'severe' or 'very severe' score on the anxiety, depression or hostility subscales of the SCL-90-r. This resulted in the dichotomous variable of either or not having mental health disturbances (cf. van der Velden et al., 2010).

General health

Self-rated health was measured at baseline by a single question from the RAND-36 survey (Hays et al., 1993). The question rated respondent's self-rated health on five options ranging from poor to excellent. This was further categorized into low (poor or moderate) and high (good, very good or excellent). Healthcare use measured at baseline was dichotomized in respondents not being in care, and respondents who were in care currently of a home

physician or a medical specialty, such as a psychiatrist/psychologist, cardiologist and/or dermatologist.

Work circumstances

Respondents were asked at baseline whether they had experienced a potentially traumatic event recently. The respondent was presented with a list of potentially traumatic event derived from earlier research on stressful experiences among police officers. Options were for example confrontations with murder, undergoing physical violence or aiding in traffic accidents. A blank answering option was provided if the fixed options did not fit the experience of the respondent. Respondents were also asked when this potentially traumatic event took place. Potentially traumatic event experience was operationalized by having such experience up to two months prior to baseline. Officers were asked at baseline to which extent they consider working as a police officer to be attractive, to obtain a measure of job satisfaction. Answers on the degree of attractiveness were dichotomized according to 1) 'not', 'a little' and 'relatively' and 2) 'quite' and 'very'. During the time study the Dutch police force was undergoing a nationwide reorganization, a stressor that may affect their mental health. Respondents were asked at baseline if this reorganization affected their position. For the present scores were dichotomized into either: 1) 'yes' and 2) 'no' or 'don't know'. As mentioned, participation in a mental strength training was added to the list of predictors, to control for possible effects.

Statistical analyses

Using chi-squared tests for mental health disturbances and non-parametric Mann-Whitney U-tests for continuous resilience measures, respondents that dropped out (n = 593) were compared to the respondents that participated in both baseline and three month follow-up (n = 566), and those that participated in all three measurement moments (n = 364).

Three-step hierarchical logistic regression analyses were used to test our hypothesis, while separately analyzing the dependent variables of mental health disturbances at baseline and follow-ups ate three and nine months. In the first step only psychological resilience was entered. In step two demographic factors (age, gender and educational level) and work-related factors (police work attractiveness, reorganizational consequences, participation in mental strength training, potentially traumatic event experience prior to baseline) were added. In step three baseline mental health disturbances (in the case of longitudinal associations), self-rated health and healthcare use were added. All, analyses were done for the RS-nl and MTQ-48 Total scores and subscales separately to avoid multicollinearity problems. We conducted the cross-sectional analyses to be able to compare our findings with current cross-sectional studies.

Lastly, we determined the additional predictive value of psychological resilience on follow-up mental health disturbances. Based on the outcomes of the multivariate logistic regression analyses predicting mental health disturbances at three and nine months, observed and predicted mental health disturbances values were cross-tabulated to gain insight in the Sensitivities, Specificities, Negative predictive values and Positive predictive values. These values were calculated for the full models predicting mental health disturbances at three and nine months excluding psychological resilience and full models including psychological resilience.

IBM SPSS was used for all analyses.

Results

Comparisons of those who participated at baseline and three months (drop outs) and those who participated in all measurement moments did not yield any differences in resilience nor mental health disturbances prevalence. However, dropouts were younger of age, experienced less reorganizational consequences, participated more often in the Mental

Strength resilience training, and more potentially traumatic event experience up to two months prior to baseline. Additionally, dropouts had a slightly higher educational level.

Table 1 outlines the baseline demographics, work circumstances and health characteristics of the full sample (n = 566) and the subsample of officers who participated at nine months (n = 364).

All cross-sectional associations between psychological resilience at baseline and mental health disturbances at baseline were significant except for Interpersonal confidence. At step three Personal competence (RS-nl) was no longer an independent predictor (see Table 2).

Table 1. Baseline demographic, work circumstances and health factors of T1-T2 participants and T1-T3 participants.

	T1-T2 participants[a]		T1-T3 participants[b]	
	n	(%)	n	(%)
T1 Anxiety				
Below average/moderate	532	(94.7)	343	(95.0)
Severe/very severe	30	(5.3)	18	(5.0)
T1 Depression				
Below average/moderate	517	(92.3)	331	(91.9)
Severe/very severe	43	(7.7)	29	(8.1)
T1 Hostility				
Below average/moderate	507	(90.4)	328	(91.1)
Severe/very severe	54	(9.6)	32	(8.9)
T1 PTSD[a]				
Non-case	563	(99.5)	361	(99.2)
Case	3	(0.5)	3	(0.8)
T1 MHD[b]				
Absent	484	(85.5)	313	(86.0)
Present	82	(14.5)	51	(14.0)
Current healthcare use				
Under care of home physician or medical specialty	125	(22.3)	85	(23.5)
Not under care	436	(77.7)	276	(76.5)
Self-rated health				
Bad/moderate	45	(92.0)	31	(91.5)
Good/Very good/Excellent	521	(8.0)	333	(8.5)
Age				
18-36	181	(32.5)	94	(26.3)
36-51	186	(33.4)	126	(35.2)
52-66	190	(34.1)	138	(38.5)
Gender				
Female	148	(26.3)	92	(25.5)
Male	414	(73.7)	269	(74.5)
Educational level				
Low	75	(13.4)	52	(14.4)
Middle	445	(79.3)	286	(79.2)
High	41	(7.3)	23	(6.4)

Continued

Table 1. (*Continued*)

Police work attractiveness				
Quite or very attractive	422	(74.7)	275	(75.8)
Not, a little or relatively attractive	143	(25.3)	88	(24.2)
Reorganizational consequences				
Yes	166	(29.4)	114	(31.4)
No or don't know	399	(70.6)	249	(68.6)
Mental Strength training participation				
Non participant	273	(48.2)	203	(55.8)
Participant	293	(51.8)	161	(44.2)
PTE experience between 2 months before T1				
Yes	355	(62.7)	215	(59.1)
No	211	(37.3)	149	(40.9)

Note. PTSD: post-traumatic stress disorder; MHD: mental health disturbances; PTE: potentially traumatic event.

[a] Participants at baseline and 3 month follow-up (n = 566).

[b] Participants at baseline and 3 and 9 month follow-up (n = 364).

With respect to mental health disturbances at three months, on a bivariate level psychological resilience at baseline was a significant predictor for seven out of eight scales (see Table 3). After adding the health related predictors in the analyses at step three, only the RS-nl Total score and Personal competence remained significant predictors for mental health disturbances at three months. In addition, those with medium levels of Challenge (MTQ-48) had a significant lower rate of mental health disturbances at three months compared to those with low levels. A similar pattern was found for those with high levels of Commitment (MTQ-48).

Table 2. Results of Hierarchical Logistic Regression on MHD at T1 (n = 566)

				Step 1 [a]		Step 2 [b]		Step 3 [c]	
	N	n^{MHD}	$\%^{MHD}$	OR	(95 CI%)	OR	(95 CI%)	OR	(95 CI%)
T1 Total score RS-nl									
L	181	46	25.4	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
M	189	21	11.1	0.36	(0.20-0.63)***	0.38	(0.21-0.70)**	0.45	(0.24-0.84)*
H	193	14	7.3	0.23	(0.12-0.43)***	0.25	(0.13-0.49)***	0.27	(0.13-0.54)***
T1 Personal competence RS-nl									
L	204	45	22.1	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
M	177	20	11.3	0.45	(0.26-0.81)**	0.50	(0.27-0.91)*	0.56	(0.30-1.05)
H	181	16	8.8	0.35	(0.19-0.64)***	0.38	(0.20-0.72)**	0.36	(0.19-0.71)**
T1 Acceptance of self and life RS-nl									
L	180	49	27.2	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
M	224	22	9.8	0.28	(0.16-0.49)***	0.26	(0.15-0.47)***	0.31	(0.17-0.56)***
H	158	9	5.7	0.16	(0.08-0.34)***	0.17	(0.08-0.38)***	0.20	(0.09-0.45)***
T1 Dealing with difficult circumstances RS-nl									
L	124	36	29.0	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
M	232	31	13.4	0.37	(0.22-0.64)***	0.41	(0.23-0.72)**	0.50	(0.27-0.91)*
H	208	14	6.7	0.18	(0.09-0.34)***	0.20	(0.10-0.41)***	0.22	(0.11-0.46)***
T1 Total score MTQ-48									
L	182	43	23.6	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
M	174	26	14.9	0.34	(0.19-0.62)***	0.35	(0.19-0.63)***	0.36	(0.19-0.67)**
H	174	13	7.5	0.15	(0.07-0.32)***	0.15	(0.07-0.34)***	0.18	(0.08-0.40)***
T1 Challenge MTQ-48									
L	224	49	21.9	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
M	168	18	10.7	0.44	(0.25-0.79)**	0.46	(0.25-0.84)*	0.48	(0.25-0.90)*
H	169	15	8.9	0.35	(0.19-0.66)**	0.39	(0.20-0.76)**	0.42	(0.22-0.83)*
T1 Commitment MTQ-48									
L	165	43	26.1	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
M	187	26	13.9	0.46	(0.27-0.80)**	0.44	(0.25-0.77)**	0.53	(0.29-0.96)*
H	205	12	5.9	0.18	(0.09-0.35)***	0.20	(0.10-0.41)***	0.22	(0.11-0.46)***
T1 Interpersonal confidence MTQ-48									
L	188	32	17.0	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
M	175	25	14.3	0.79	(0.44-1.40)	0.79	(0.44-1.44)	0.84	(0.45-1.58)
H	200	25	12.5	0.68	(0.39-1.21)	0.70	(0.38-1.29)	0.71	(0.38-1.35)

Abbreviations: OR: odds ratio; MHD: mental health disturbances (prevalence of 'severe' or 'very severe' anxiety, depression or hostility scores or positive PTSD screen); RS-nl: Resilience Scale-nl; MTQ-48: Mental Toughness Questionnaire 48; L: Low; M: Middle; H: High.

* $p < 0.05$

** $p < 0.01$
*** $p < 0.001$
[a] Bivariate
[b] Adjusted for demographics (age, gender, educational level) and work circumstances (experience with potentially traumatic event, attractiveness of police work, affected by reorganization, mental strength training participation)
[c] Adjusted for same factors as step 2, and self-rated health and healthcare us

Table 3. Results of Hierarchical Logistic Regression on MHD at T2 (n = 566).

				Step 1 [a]		Step 2 [b]		Step 3 [c]	
	N	n^{MHD}	$\%^{MHD}$	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
T1 Total score RS-nl									
L	181	47	26.0	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
M	189	21	11.1	0.34	(0.19-0.59)***	0.36	(0.20-0.65)***	0.46	(0.23-0.93)*
H	193	18	9.3	0.28	(0.16-0.51)***	0.31	(0.16-0.57)***	0.42	(0.20-0.86)*
T1 Personal competence RS-nl									
L	204	50	24.5	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
M	177	17	9.6	0.32	(0.18-0.58)***	0.34	(0.18-0.63)***	0.36	(0.18-0.74)**
H	181	18	9.9	0.33	(0.19-0.60)***	0.35	(0.19-0.65)***	0.39	(0.19-0.80)**
T1 Acceptance of self and life RS-nl									
L	180	49	27.2	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
M	224	24	10.7	0.32	(0.19-0.56)***	0.31	(0.18-0.54)***	0.54	(0.28-1.02)
H	158	13	8.2	0.24	(0.12-0.46)***	0.26	(0.13-0.53)***	0.48	(0.22-1.05)
T1 Dealing with difficult circumstances RS-nl									
L	124	34	27.4	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
M	232	28	12.1	0.37	(0.21-0.65)***	0.41	(0.23-0.74)**	0.74	(0.36-1.50)
H	208	24	11.5	0.35	(0.19-0.62)***	0.41	(0.22-0.76)**	0.81	(0.38-1.71)
T1 Total score MTQ-48									
L	182	43	23.6	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
M	174	26	14.9	0.57	(0.33-0.99)*	0.55	(0.31-0.98)*	0.90	(0.46-1.75)
H	174	13	7.5	0.26	(0.13-0.50)***	0.26	(0.13-0.54)***	0.50	(0.22-1.12)
T1 Challenge MTQ-48									
L	224	50	22.3	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
M	168	14	8.3	0.32	(0.17-0.60)***	0.31	(0.16-0.60)***	0.39	(0.18-0.82)*
H	169	23	13.6	0.55	(0.32-0.94)*	0.59	(0.33-1.05)	0.85	(0.43-1.71)
T1 Commitment MTQ-48									
L	165	42	25.5	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
M	187	29	15.5	0.53	(0.31-0.89)*	0.47	(0.27-0.82)**	0.83	(0.43-1.60)
H	205	15	7.3	0.22	(0.12-0.42)***	0.24	(0.12-0.47)***	0.39	(0.18-0.84)*
T1 Interpersonal confidence MTQ-48									
L	188	32	17.0	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
M	175	22	12.6	0.71	(0.39-1.28)	0.71	(0.38-1.31)	0.90	(0.43-1.85)
H	200	33	16.5	0.95	(0.56-1.62)	0.99	(0.56-1.77)	1.34	(0.67-2.67)

Note. OR: odds ratio; MHD: mental health disturbances (prevalence of 'severe' or 'very severe' anxiety, depression or hostility scores or positive PTSD screen); RS-nl: Resilience Scale-nl; MTQ-48: Mental Toughness Questionnaire 48; L: Low; M: Middle; H: High.

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

[a] Bivariate

[b] Adjusted for demographics (age, gender, educational level) and work circumstances (experience with potentially traumatic event, attractiveness of police work, affected by reorganization, mental strength training participation)

[c] Adjusted for same factors as step 2 and self-rated health, healthcare use and T1 MHD

Table 4. Results of hierarchical logistic regression on MHD at T3 (*n* = 364).

				Step 1 [a]		Step 2 [b]		Step 3 [c]	
	N	n^{MHD}	$\%^{MHD}$	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
T1 Total score RS-nl									
L	109	25	22.9	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
M	133	17	12.8	0.52	(0.26-1.03)	0.51	(0.25-1.07)	0.80	(0.35-1.83)
H	118	11	9.3	0.38	(0.17-0.81)*	0.41	(0.18-0.94)*	0.67	(0.27-1.69)
T1 Personal competence RS-nl									
L	125	24	19.2	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
M	122	16	13.1	0.63	(0.31-1.27)	0.63	(0.30-1.32)	0.93	(0.41-2.11)
H	112	12	10.7	0.53	(0.25-1.13)	0.60	(0.27-1.34)	0.82	(0.33-2.00)
T1 Acceptance of self and life RS-nl									
L	113	27	23.9	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
M	141	21	14.9	0.55	(0.29-1.04)	0.57	(0.29-1.11)	0.98	(0.47-2.08)
H	106	5	4.7	0.17	(0.06-0.45)***	0.18	(0.06-0.51)**	0.30	(0.10-0.92)*
T1 Dealing with difficult circumstances RS-nl									
L	72	15	20.8	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
M	159	25	15.7	0.75	(0.36-1.56)	0.79	(0.37-1.69)	1.58	(0.63-3.97)
H	129	13	10.1	0.46	(0.20-1.05)	0.52	(0.22-1.25)	1.18	(0.42-3.32)
T1 Total score MTQ-48									
L	108	19	17.6	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
M	113	20	17.7	1.02	(0.50-2.07)	1.00	(0.48-2.08)	2.08	(0.85-5.09)
H	116	11	9.5	0.52	(0.23-1.16)	0.48	(0.20-1.14)	1.13	(0.40-3.19)
T1 Challenge MTQ-48									
L	139	28	20.1	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
M	110	11	10.0	0.49	(0.23-1.05)	0.46	(0.21-1.00)	0.57	(0.24-1.35)
H	111	15	13.5	0.68	(0.34-1.37)	0.75	(0.35-1.62)	1.06	(0.45-2.48)
T1 Commitment MTQ-48									
L	97	22	22.7	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
M	122	17	13.9	0.54	(0.27-1.11)	0.46	(0.22-0.97)*	0.85	(0.37-1.98)
H	138	15	10.9	0.43	(0.21-0.89)*	0.45	(0.21-0.96)*	0.81	(0.34-1.93)
T1 Interpersonal confidence MTQ-48									
L	120	18	15.0	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
M	109	15	13.8	0.89	(0.41-1.90)	0.85	(0.39-1.87)	1.01	(0.43-2.39)
H	132	21	15.9	1.13	(0.56-2.27)	1.21	(0.56-2.58)	1.61	(0.68-3.82)

Abbreviations: OR: odds ratio; MHD: mental health disturbances (prevalence of 'severe' or 'very severe' anxiety, depression or hostility scores or positive PTSD screen); RS-nl: Resilience Scale-nl; MTQ-48: Mental Toughness Questionnaire 48; L: Low; M: Middle; H: High.

[a] Bivariate

[b] Adjusted for demographics (age, gender, educational level) and work circumstances (experience with potentially traumatic event, attractiveness of police work, affected by reorganization, mental strength training participation)

[c] Adjusted for same factors as step 2 and self-rated health, healthcare use and T1 MHD

Psychological resilience baseline was a significant predictor of mental health disturbances at nine months only in three out of eight scales on a bivariate level. Those with the highest levels on the RS-nl Total score, and subscales of Acceptance of self and life (RS-nl) and Commitment (MTQ-48; Table 4) were less likely to have mental health disturbances at nine months. After entering health-related predictors at step three, those with high levels of Acceptance of self and life (RS-nl) had a significant lower rate of mental health disturbances at nine months compared to those with low levels. Predictors of nine-month mental health disturbances were tested among the subsample of 364 officers. Analyses of three-month mental health disturbances predictors among this subsample yielded similar results as compared to the entire sample of 566.

The strongest independent predictor for mental health disturbances at three and nine months (not shown in Tables) was mental health disturbances at baseline. After step three the adjusted OR's for mental health disturbances at three months were ≥ 9.52 and for mental health disturbances at nine months ≥ 6.32. Of the officers without mental health disturbances at T, 8.3% had mental health disturbances at three months and 9.3% at nine months, and of the officers with MHD at baseline 57.3% and 49.0% had mental health disturbances at three and nine months respectively.

We repeated the analyses with depression and hostility as study variables (and thus smaller samples of respondents with problems), instead of the composite mental health disturbances variable. The results were similar to the pattern reported here for the composite mental health disturbances score. Due to lower cell counts, separate analyses were not conducted for anxiety and PTSD.

Results show that the full models including the RS-nl scales performed somewhat better on Sensitivity and on Positive predictive values for mental health disturbances at three

months than full models without, this was not the case for the MTQ-48 measures of resilience (see Table 5). The results with respect to mental health disturbances at nine months were similar for models with and without resilience measures.

Table 5. Differences in classification functions for MHD at T2 and T3 of multivariate models with and without psychological resilience

	MHD at T2				MHD at T3			
	SE	SP	NPV	PPV	SE	SP	NPV	PPV
RS-nl								
All predictors, except Total score[a]	.36	.97	.89	.67	.20	.98	.88	.59
All predictors, including Total scores[b]	.43	.97	.90	.76	.18	.98	.87	.64
All predictors, except Personal competence[a]	.36	.97	.89	.70	.20	.98	.88	.59
All predictors, including Personal competence[b]	.46	.98	.91	.78	.20	.98	.88	.59
All predictors, except Acceptance self/life[a]	.36	.96	.89	.66	.20	.98	.88	.59
All predictors, including Acceptance self/life[b]	.41	.97	.90	.71	.18	.98	.87	.56
All predictors, except Dealing diff. circumst.[a]	.36	.97	.89	.67	.20	.98	.88	.59
All predictors, including Dealing diff. circumst[b]	.37	.97	.89	.73	.22	.97	.88	.58
MTQ-48								
All predictors, except Total score[a]	.34	.96	.88	.65	.23	.98	.88	.69
All predictors, including Total score[b]	.33	.97	.88	.66	.23	.97	.88	.58
All predictors, except Challenge[a]	.36	.97	.89	.67	.19	.98	.87	.63
All predictors, including Challenge[b]	.40	.96	.89	.69	.23	.98	.88	.63
All predictors, except Commitment[a]	.35	.96	.89	.65	.19	.98	.87	.63
All predictors, including Commitment[b]	.37	.96	.89	.67	.21	.98	.87	.61
All predictors, except Interp. confidence[a]	.36	.96	.89	.66	.19	.98	.87	.63
All predictors, including Interp. confidence[b]	.39	.96	.89	.67	.21	.97	.88	.58

Abbreviations: MHD: mental health disturbances; SE: sensitivity; SP: specificity; NPV: negative predictive value; PPV: positive predictive value; RS-nl: Resilience Scale-nl; MTQ-48: Mental Toughness Questionnaire-48.

[a] Model including demographic, work circumstances and self-rated health, healthcare use and T1 MHD.

[b] Model as above, including psychological resilience measure.

A complete overview of the outcomes of all analyses can be provided by the first author upon request.

We conducted two control analyses in which we divided resilience scores (RS-total and MTQ-total) in four rather than three categories with more or less the same numbers of

respondents in each category. The outcomes were similar to the analyses using three categories.

Discussion

Based on previous studies, we hypothesized that the predictive value of psychological resilience would decrease over time and especially when controlling for health-related variables at baseline. We used a large sample of police officers, while stepwise controlling for baseline health-related variables, demographics and work circumstances. Our findings support our hypothesis: at three months the predictive value declined sharply especially when adjusting for existing mental health disturbances and health at baseline. All but one psychological resilience scale, was cross-sectionally associated with mental health disturbances, however no longer when examining longitudinal associations. This conclusion becomes more stringent when applying a Bonferonni correction to the α-level: five psychological resilience scales are cross-sectionally associated with mental health disturbances, but only a single measure (personal competence) is longitudinally associated with 3-month mental health disturbances. Moreover, the current study highlights the importance of longitudinal designs for examining associations between resilience and mental health compared to cross-sectional studies. The inclusion of time in the research design has a serious strength decreasing effect on this association. This could lead to overestimation of the effect when relying solely on cross-sectional studies. Although this is the first study among police officers examining the independent predictive value of resilience for mental health disturbances at three different stages, our findings are in line with earlier research on the predictive value of psychological resilience while correcting for baseline mental health or psychiatric history (Dolan and Adler, 2006; Thomassen et al., 2015; Wild et al., 2016; Youssef et al., 2013). All these studies show small to medium significant associations

between psychological resilience and mental health disturbances with follow-ups <1 year, and small to no effects with follow-ups > 1 year.

The current study highlights the importance to adjust for (especially) health-related variables when examining the predictive value of psychological resilience on subsequent mental health disturbances. Our results show that mental health disturbances at baseline was a very strong independent predictor for mental health disturbances at three months and at nine months after baseline, in contrast to measures of psychological resilience. In fact, in an earlier large study among Dutch police officers similarly high adjusted Odds Ratios (OR's) were found for mental health disturbances predicting mental health disturbances 2.5 years later (van der Velden et al., 2010). Moreover, our current prospective findings alongside the results of previous cross-sectional and longitudinal studies raise the critical question what the concept of psychological resilience as a protective personal characteristic adds to our understanding of why rescue workers, in this case police officers, develop mental health disturbances. Within a period of nine months, the independent predictive value of the psychological resilience variables declined sharply after baseline and especially after three months. We were not able to examine the independent predictive value of resilience for mental health disturbances one or two months later. Perhaps this would have yielded significant and higher adjusted OR's, but given all findings we may expect that the adjusted OR's for mental health disturbances at baseline would be even higher when predicting mental health disturbances at three months, further questioning the practical importance of resilience as a risk factor. The relevance of this question is supported by the outcomes of previous research on the predictive value of psychological resilience on the longer term. Previous studies specifically among police officers (de Terte et al., 2014; Marchand et al., 2015) examining predictors of posttraumatic stress and general psychological distress over the long term (> 1 year), showed that resilience was not a significant predictor for mental health

problems: not on a bivariate level nor adjusted for control variables applied in these studies which did not include any baseline mental health (de Terte et al., 2014; Marchand et al., 2015). In sum, all these findings clearly suggest that the identification of rescue workers at risk for the development of mental health disturbances does not stand to benefit much from the psychological resilience concept.

To the best of our knowledge, this is the first study using two instruments of psychological resilience, providing the opportunity to compare their predictive values. In the current study the independent predictive values of the RS-nl and MTQ-48 show some differences suggesting that, although the independent predictive values of both are very limited, the RS somewhat better predicts mental health disturbances at follow-ups than the MTQ-48. This was further demonstrated by the better Sensitivities and Negative predictive values of the full models with the RS-nl scales predicting mental health disturbances at three months. A possible explanation for this finding could be that the RS-nl was originally developed for measuring treatment gains among patients with mental health disabilities, while the MTQ-48 was developed in a context of thriving under high stress circumstances as found in the context of sports. However, future studies among other occupations at risk for mental health problems due to the nature of their work, are warranted in order to confirm these findings.

Despite using two distinct measures of psychological resilience, and thereby, tapping into a broad range of psychological resilience factors, the current operationalization did not cover the full breadth of factors associated with psychological resilience (Meredith et al., 2011; Pangallo et al., 2015). The RS-nl cover personal competence (related to self-efficacy), handling difficult circumstances and acceptance (Wagnild and Young, 1993). The MTQ-48 subscales used in the current studied interpersonal confidence, commitment and challenge

(Clough et al., 2007). It could be that other factors yield other, and potentially stronger longitudinal associations, with mental health outcomes.

The limited predictive value of psychological resilience as found in the current study and previous studies (de Terte et al., 2014; Dolan and Adler, 2006; Marchand et al., 2015; Thomassen et al., 2015; Wild et al., 2016; Youssef et al., 2013), could also be affected by range restriction. Due to the rigorous selection program as implemented in the Netherlands, Dutch police officers might be a less heterogeneous subsample of the workforce with respect to psychological resilience, in comparison to other occupations. Longitudinal studies on military selection do show small to moderate effects of resilience on subsequent admission into military training (Gayton and Kehoe, 2015; Hystad et al., 2011) or attrition during military training (Bezdjian et al., 2017; Hardy et al., 2010; Maddi et al., 2012; Williams et al., 2016). These studies suggest that resilience is higher among those who make it through selection and initial training and into rescue worker occupations. To illustrate our points: the police officers that comprise the lowest scoring groups on the RS-nl and MTQ-48 in the current sample still do not score very low on these measurement instruments. Previous research (van der Velden et al., 2013) has also shown that Dutch police officers have favorable prevalence rates of severe scores of anxiety, depression or hostility compared to soldiers, bank employees or psychiatric hospital personnel. The prevalence of mental health disturbances in the current study is comparable to both the samples of police officers in this study (van der Velden et al., 2013). Therefore, range restriction could indeed have influenced the magnitude of the effect sizes in the current study, and this may be a common problem in other studies examining associations between psychological resilience and mental health disturbances in rescue worker samples. Future research should establish the influence of range restriction on these associations.

Limitations

Between the baseline and follow-up measurement attrition occurred. However, bivariate analyses revealed no significant differences in the key-variables in our study (psychological resilience and mental health disturbances) between respondents that only participated at baseline, compared to those who participated until three months or who participated throughout all measurement moments.

In the present study mental health disturbances was a composite variable, based on anxiety and depression symptoms, PTSD-symptoms and hostility at each survey. We did not include other mental health problems such as burn-out (Fyhn et al., 2016) or somatization (Ojedokun and Balogun, 2015). It is possible that including such other mental health variables in our mental health disturbances measure would affect the predictive value of resilience, although we consider this possibility unlikely given the marked overlap between burnout and somatization on the one hand and our assessed mental health problems on the other. We assessed several predictors besides mental health disturbances and resilience, such as work circumstances and general health. We have no information on other factors that are associated with mental health disturbances such as social support (de Terte et al., 2014) and personality factors (Yuan et al., 2011), that may have influenced our findings. However, it is to be expected that including additional predictors would decrease the predictive value of psychological resilience further.

We used two different instruments measuring psychological resilience but both are self-report measures. To the knowledge of the authors, there are no more objective measures, such as ratings by officers' superior, available for psychological resilience. The inclusion of such alternative measures might enhance the validation of psychological resilience measurements in future research.

Following previous studies on resilience among police officers, we considered resilience as a personal capacity to mitigate stress levels caused by circumstances that are

likely to induce stress, such as potentially traumatic experiences. Other scholars do not consider resilience as a personal capacity, but as a process or phenomenon (Cf. Luthar et al., 2000). It was outside the aim of the present study to assess the predictive value of resilience according to other concepts of resilience.

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