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"Humor as a resource for fostering flow experience and alleviating stress in the healthcare context"

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List of Publications

For this thesis, in addition to the general introduction and the general discussion, a total of three publications was prepared. In total, this thesis consists of five chapters.

The publication "On the Relationships Between Humour, Stress and Flow Experience-Introducing the Humour-Flow Model" from Chapter 2 is a book chapter first published in *The Palgrave Handbook of Humour Research.* It should be noted that Chapter 2 was written in British English.

The publication "Negative effects of the COVID-19 pandemic on nurses can be buffered by a sense of humor and appreciation" in Chapter 3 has been accepted after peer-review for publication in *BMC Nursing*. The publication will be available as open access after publication.

The publication "Care for Joy: Evaluation of a Humor Intervention and Its Effects on Stress, Flow Experience, Work Enjoyment, and Meaningfulness of Work" in Chapter 4 has already been published after a peer-review process in *Frontiers in Public Health* as open access.

In psychological research, it is habitual for co-authors to be involved in publications. All the co-authors are listed below. The publications are included in this thesis as published (Chapter 2 & 4) or accepted (Chapter 3). Only minor formatting changes have been made, e.g., to the tables, citation style, presentation of statistics, or figures, in order to achieve a consistent formatting style throughout this thesis.

Chapter 2 - First published in:

Bartzik, M., & Peifer, C. (2021). On the relationships between humour, stress and flow experience—Introducing the Humour-Flow Model. In E. Vanderheiden & C.-H. Mayer (Eds.), *The Palgrave Handbook of Humour Research* (pp. 479–496). Palgrave Macmillan. https://doi.org/10.1007/978-3-030-78280-1_24

Chapter 3 - Accepted in BMC Nursing:

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Chapter 4 - First published in:

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General Abstract

This thesis deals with humor, flow experience, and stress in the context of healthcare.

Humor can be considered as a personality trait, the so-called "*sense of humor*". Martin (2003) classifies the sense of humor as a habit, a skill, a character trait, a reaction to humorous material, an attitude, a worldview, or a coping strategy. Flow is described in research as a pleasant and rewarding state of complete absorption while performing activities. Early in flow research, clear feedback, clear goals, and a balance of demands and skills were described as facilitating flow (Csikszentmihalyi, 1975). Stress is a reaction arising from the relationship between the person and the environment. As soon as a person perceives a stressor from the environment as a strain or the stressor exceeds the person's own resources for coping, stress may ensue (Lazarus & Folkman, 1984).

The aim of this thesis is to investigate whether humor can be a fostering factor facilitating flow and at the same time reduce stress in healthcare. In order to investigate the hypotheses, a total of three publications was prepared for this thesis.

In the first publication (Chapter 2), the relationships between humor, flow, and stress were presented in a theoretical publication. Humor and flow each show relationships with stress (McGhee, 2010; Peifer & Wolters, 2021) and both constructs have been described as coping strategies (Martin, 2003; Weimar, 2005). The *Humor-Flow Model* was derived from the *Transactional Model of Stress and Flow* (Peifer, 2012; Peifer & Tan, 2021), which hypothesizes that humor as a resource can directly promote flow, buffer experienced stress, and transform stress into flow.

In the second publication (Chapter 3), a questionnaire study was conducted with a total of 174 nurses during the COVID-19 pandemic to ascertain whether the COVID-19 pandemic as a stressor exerted negative effects on flow experience as well as on stress. Humor was actively used as a coping strategy by nurses in the COVID-19 pandemic (Sun et al., 2020), and therefore, the present study investigated whether humor can act as a protective factor in relation to the negative effects of the COVID-19 pandemic. The results showed that among nurses, the COVID-19 pandemic had a negative effect on flow experience as well as on stress. Also, humor was reported to have a buffering effect on the negative effects of the COVID-19 pandemic in terms of flow experience and healthcare stress.

In the third publication (Chapter 4), an intervention study was conducted with nurses in training at two nursing schools with a total of two measurement time points. The intervention group

received a humor intervention, while none was conducted in the control group. Humor is a construct that can be trained (McGhee, 2010). The aim of this study was to show that a humor intervention can foster (1) humor and (2) flow experience, and (3) reduce perceived stress among nurses in training. At the same time, the humor intervention should be evaluated. The results showed that humor values in the intervention group remained stable over time, while they decreased in the control group. Furthermore, the humor intervention affected flow experience mediated by humor (indirect effect). In contrast, humor did not mediate the effect of the humor intervention on perceived stress. However, the mediation model showed a negative relationship between humor and perceived stress. In conclusion, fostering humor in healthcare can increase flow experience and reduce perceived stress. Furthermore, the evaluation results of the humor intervention could be considered positive. The following aspects were considered in the evaluation results: Subjective enjoyment while performing the humor intervention, perceived usefulness of the humor intervention, perceived difficulty of the humor intervention, subjective knowledge gain from the humor intervention, and a positive attitude toward the humor intervention.

This thesis shows through the theoretical foundation and empirical findings in Chapters 2 through 4 that humor has the potential to foster flow experience and reduce stress in healthcare settings. The “Humor-Flow Model” describes how humor can be actively used as a resource to foster flow experience in a direct way, to reduce experienced stress and to transform it into flow. Even under extraordinary work circumstances (COVID-19 pandemic) it could be proven that humor can buffer against the negative effects of these work circumstances and thus increase flow experience and reduce stress. A humor intervention can foster humor in healthcare and simultaneously increase flow experiences. Humor is also considered an effective coping strategy for dealing with stress.

Future research can use the “Humor-Flow Model” as a basis for fostering flow experience and alleviating stress in healthcare as well as in other work contexts. At the same time, future research may extend the model.

Allgemeine Zusammenfassung

Die vorliegende Thesis beschäftigt sich mit Humor, Flow-Erleben und Stress im Kontext des Gesundheitswesens.

Humor kann als eine Persönlichkeitsvariable, der sogenannte „*sense of humor*“, betrachtet werden. Martin (2003) klassifiziert den sense of humor als eine Gewohnheit, eine Fähigkeit, eine Charaktereigenschaft, eine Reaktion auf humorvolles Material, eine Einstellung, eine Weltanschauung oder eine Coping-Strategie. Flow wird in der Forschung als ein angenehmer und belohnender Zustand der vollständigen Absorbiertheit beim Ausführen von Aktivitäten beschrieben. Bereits früh in der Flow Forschung wurde klares Feedback, klare Ziele und eine Balance von Anforderungen und Fähigkeiten als Flow-förderliche Faktoren beschrieben (Csikszentmihalyi, 1975). Stress ist eine Reaktion, die aus der Beziehung zwischen Person und Umwelt entsteht. Sobald eine Person einen Stressor aus der Umwelt als belastend wahrnimmt oder der Stressor die eigenen Ressourcen zur Bewältigung übersteigt, kann Stress entstehen (Lazarus & Folkman, 1984).

Ziel dieser Arbeit ist es zu untersuchen, ob auch Humor ein Flow-förderlicher Faktor im Gesundheitswesen darstellen und gleichzeitig Stress reduzieren kann. Um diese Hypothesen zu untersuchen, wurden für diese Thesis insgesamt drei Publikationen angefertigt.

In der ersten Publikation (Kapitel 2) wurden die Zusammenhänge von Humor, Flow und Stress in einer theoretischen Publikation dargestellt. Humor und Flow zeigen jeweils Zusammenhänge mit Stress (McGhee, 2010; Peifer & Wolters, 2021) und beide Konstrukte werden als Coping-Strategien beschrieben (Martin, 2003; Weimar, 2005). Aus dem *Transactional Model of Stress and Flow* (Peifer, 2012; Peifer & Tan, 2021) wurde das *Humor-Flow Model* abgeleitet, welches die Hypothese aufstellt, dass Humor als Ressource Flow direkt fördern, erlebten Stress abpuffern und Stress zu Flow transformieren kann.

In der zweiten Publikation (Kapitel 3) wurde eine Fragebogenstudie mit insgesamt 174 Pflegekräften während der COVID-19 Pandemie durchgeführt. Es wurde untersucht, ob die COVID-19 Pandemie als Stressor negative Effekte auf Flow-Erleben sowie Stress ausübte. Humor wurde in der COVID-19 Pandemie von Pflegekräften aktiv als Coping-Strategie genutzt (Sun et al., 2020) und daher untersuchte die vorliegende Studie, ob Humor als protektiver Faktor in Bezug auf die negativen Effekte der COVID-19 Pandemie wirken kann. Es zeigte sich in den Ergebnissen, dass sich bei Pflegekräften die COVID-19 Pandemie negativ auf Flow-Erleben sowie auf Stress auswirkte. Auch konnte berichtet werden, dass Humor eine

abpuffernde Wirkung auf die negativen Effekte der COVID-19 Pandemie in Bezug auf Flow Erleben und Stress im Gesundheitswesen hat.

In der dritten Publikation (Kapitel 4) wurde eine Interventionsstudie mit Pflegekräften in Ausbildung an zwei Pflegeschulen mit insgesamt zwei Messzeitpunkten durchgeführt. Die Interventionsgruppe erhielt eine Humorintervention, während in der Kontrollgruppe keine durchgeführt wurde. Humor ist ein Konstrukt, dass trainierbar ist (McGhee, 2010). Ziel dieser Studie war es zu zeigen, dass durch eine Humorintervention bei Pflegekräften in Ausbildung (1) Humor und (2) Flow-Erleben gefördert sowie (3) wahrgenommener Stress reduziert werden kann. Gleichzeitig sollte die Humorintervention evaluiert werden. Es zeigte sich in den Ergebnissen, dass die Humor-Werte in der Interventionsgruppe im Zeitverlauf stabil blieben, während sie in der Kontrollgruppe gesunken sind. Außerdem beeinflusste die Humorintervention das durch Humor vermittelte Flow-Erlebnis (indirekter Effekt). Hingegen vermittelte Humor nicht die Wirkung der Humorintervention auf wahrgenommenen Stress. Jedoch zeigte sich im Mediationsmodell ein negativer Zusammenhang zwischen Humor und wahrgenommenen Stress. Schlussfolgernd kann eine Förderung von Humor im Gesundheitswesen Flow-Erleben steigern und wahrgenommenen Stress reduzieren. Weiterhin konnten die Evaluationsergebnisse der Humorintervention als positiv betrachtet werden. Bei den Evaluationsergebnissen wurden folgende Aspekte berücksichtigt: Subjektives Vergnügen während der Durchführung der Humorintervention, wahrgenommene Nützlichkeit der Humorintervention, die wahrgenommene Schwierigkeit der Humorintervention, subjektiver Wissenszuwachs durch die Humorintervention und eine positive Einstellung gegenüber der Humorintervention.

Diese Thesis zeigt durch die theoretische Fundierung und die empirischen Ergebnisse in den Kapitel 2 bis 4, dass Humor das Potenzial zur Förderung von Flow-Erleben und zur Reduzierung von Stress im Gesundheitswesen hat. Das „Humor-Flow Modell“ beschreibt, wie Humor aktiv als Ressource genutzt werden kann, um Flow-Erleben auf direktem Wege zu fördern, erlebten Stress zu reduzieren und in Flow zu transformieren. Auch unter außergewöhnlichen Arbeitsumständen (COVID-19 Pandemie) konnte nachgewiesen werden, dass Humor die negativen Auswirkungen dieser Arbeitsumstände abpuffern und somit Flow-Erleben steigern und Stress reduzieren kann. Durch eine Humorintervention kann Humor im Gesundheitswesen gefördert werden und gleichzeitig Flow-Erleben steigern. Humor gilt auch als eine wirksame Bewältigungsstrategie im Umgang mit Stress.

Zukünftige Forschung kann das „Humor-Flow Modell“ als Grundlage für die Förderung von Flow-Erleben und Reduzierung von Stress im Gesundheitswesen sowie in anderen Arbeitskontexten heranziehen. Gleichzeitig kann zukünftige Forschung das Modell erweitern.

Chapter 1: General Introduction

> "We´ve all heard the expression, "When life deals you lemons, make lemonade." What no one told you, however, is that the secret ingredient in this recipe is your sense of humor." (McGhee, 2010, p. 8)

Introduction to Humor

In everyday speech, humor is familiar to most of us, and most of us have some conception of what it means. McGhee (2010) claims that if you ask random people on the street if it is important to have a good sense of humor, most of them will probably agree. In everyday life, humor seems to be something good and desirable, but there is much more behind the term humor.

A closer look at the term humor shows that the term, and thus its meaning, is used differently in research. In philosophical esthetics, humor falls under the concept of the comic and is distinguished from other types of the comic, such as scoffing, joking or irony. Humor in philosophical esthetics is understood as the ability to perceive problems of the world, of people and of everyday life, cheerfully and calmly (Ruch, 2016). Humor in the Anglo-American perspective combines all concepts of the comic and can be understood as the experience of what is funny. In the Anglo-American perspective, humor can be not only good, but also aggressive and bad (Ruch, 2016).

The term humor comes from medical science. Humor derived from the Latin can be understood as "liquid" or from the Hippocratic teaching as body fluid. Hippocratic teaching argues that the various concentrations of body fluids (pure blood, phlegm, yellow bile, and black bile) have effects on the physical health of individuals, and also on how joyfully and how much a person laughs (Jouanna & Allies, 2012).

Since the Middle Ages, humor has been described as a mood and even as a talent of individuals, while since the 17th century the term humor, or rather sense of humor, has been described more as a virtue that distinguishing good humor from bad humor (Ruch, 2016).

Modern humor research began at the first "International Conference on Humor and Laughter" in 1976 and through some publications on humor published in the same time period (Goldstein & Ruch, 2018).

Today, humor as a research construct is a part of Positive Psychology (Müller & Ruch, 2011), which focuses on improving the quality of life in the past, present, and future (Seligman & Csikszentmihalyi, 2000). In Positive Psychology, humor is understood as a complex construct to which there are different theoretical approaches (e.g., "*Incongruity Theory*," "*Superiority Theory*," and "*Arousal-Relief Theory*"), each of these valid in their own way (Scheel, 2017a). *Arousal-Relief Theory* is a motivational theory that relates to intrapersonal needs through the use of humor and is intended to lead to the alleviation of tension (e.g., coping with stress). *Superiority Theory* is also a motivational theory focusing on the interpersonal aspects through humor, and as a result, aims to increase self-esteem through the use of negative and aggressive humor. *Incongruity Theory* deals with humor as a cognitive approach that refers to the perception and interpretation of incongruity. This means that individuals experience humor (e.g., laugh) when confronted with a unexpected event (for a more detailed overview of these theories see e.g., Martin & Ford, 2018; Scheel, 2017a; Wilkins & Eisenbraun, 2009).

Given the different theoretical approaches of humor, it is not surprising that many different definitions have been proposed for it (Scheel, 2017a). One possible definition of humor was proposed by Martin and Ford (2018), they defined humor as ...

> "…a broad, multifaceted term that represents anything that people say or do that others perceive as funny and tends to make them laugh, as well as the mental processes that go into both creating and perceiving such an amusing stimulus, and also the emotional response of mirth involved in the enjoyment of it." (Martin & Ford, 2018, p. 16)

In humor research there are various ways to operationalize humor. In the following sections, different ways, such as humor as a personality variable, also known as sense of humor (Ruch, 2010), and its various humor skills or habits (McGhee, 2010a; Ruch & Heintz, 2018), humor as humor styles (Martin et al., 2003), and humor as a character strength (Peterson & Seligman, 2004) will be introduced. This section moreover describes the relationship between humor and stress and the use of humor in the medical context in the form of clinic clowns and its use as an active communication and care strategy.

Sense of Humor

Humor can be described in the research context as a personality trait (Martin & Ford, 2018; Ruch, 2010). For humor as a personality trait, the term "*sense of humor*" is used and is defined by Martin (2003) as:

> "…a habitual behavior pattern (tendency to laugh frequently, to tell jokes and amuse others, to laugh at other people's jokes), an ability (ability to create humor, to amuse others, to "get the joke," to remember jokes), a temperamental trait (habitual cheerfulness), an aesthetic response (enjoyment of particular types of humorous material), an attitude (positive attitude toward humor and humorous people), a world view (bemused outlook on life), or a coping strategy (tendency to maintain a humorous perspective in the face of adversity)." (Martin, 2003, p. 315)

Sense of humor consists of the six subcomponents *laughter*, *enjoyment of humor*, *verbal humor*, *humor under stress*, *laughing at yourself*, *and finding humor in everyday life* (Ruch & Heintz, 2018). An overview of the six subcomponents of the sense of humor is presented in **Figure 1.1**. These subcomponents are also described as habits or skills (McGhee, 2010a, 2010b; Ruch & Heintz, 2018).

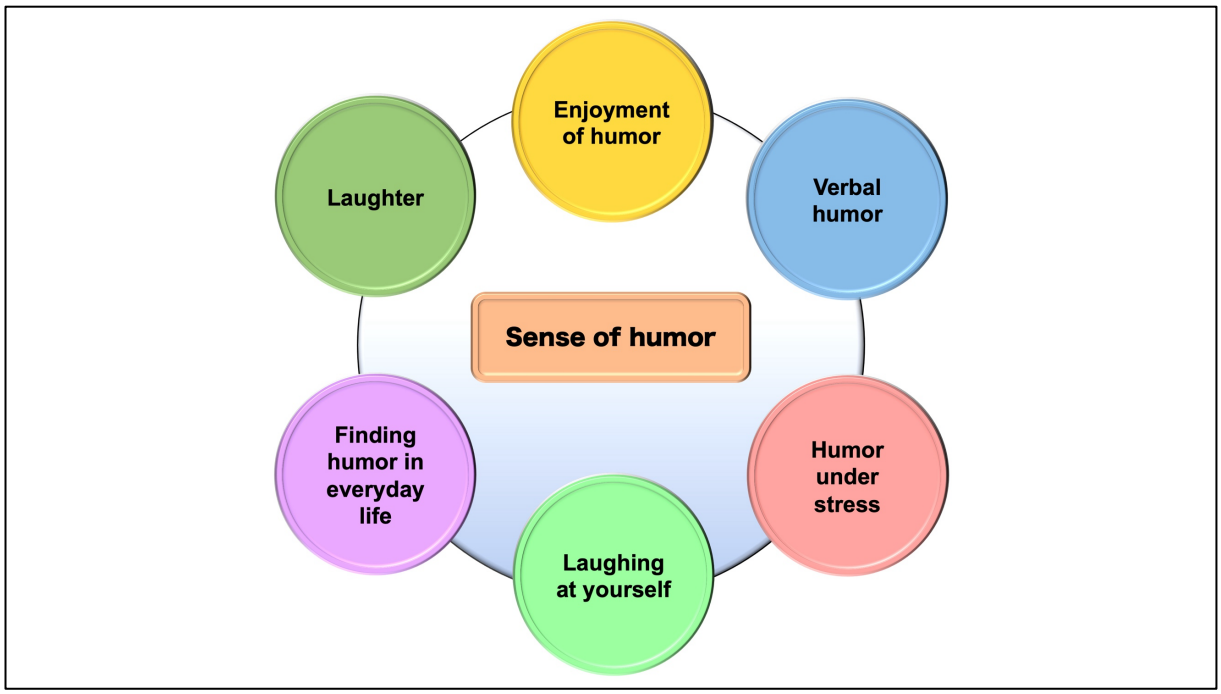

FIGURE 1.1 | The six humor skills to measure sense of humor (Ruch & Heintz, 2018).

The following describes the six humor skills according to McGhee (2010a):

(1) *Laughter* describes the humor skill in which individuals laugh out loud and heartily several times a day and feel good about it. They also actively look for reasons to laugh about something.
(2) *Enjoyment of humor* is the humor skill that describes humor as an important construct of individuals in their own lives. Individuals who enjoy humor proactively seek out humor, e.g., in the newspaper or on television.
(3) *Verbal humor* is the humor skill where individuals frequently tell jokes, funny stories, or use puns to create humor.
(4) *Humor under stress* is the humor ability that individuals do not lose under stress, but actively use as a coping strategy. Humor allows individuals to control their own moods and continue to work effectively while under stress.
(5) *Laughing at yourself* is the humor skill that allows individuals to laugh at themselves. This includes one's own imperfections, embarrassing incidents, as well as funny mistakes made. Individuals with this humor skill share their embarrassing incidents with others and also laugh when they are the butt of the joke.
(6) *Finding humor in everyday life* is described as a humor skill in which individuals find humor in everyday lives, such as in their families or at work, and tell others about their experiences.

One way to measure sense of humor is to use questionnaires. A validated measurement instrument is the *Sense of Humor Scale (SHS)* by McGhee (1999), which was extended with the *Sense of Humor parallel form (SHS-P)* by Ruch and Heintz (2018). When the *SHS* and *SHS-P* are combined, 48 items on a 7-point rating scale (1 = "not true at all" to 7 = "exactly true"*)* are used to measure the sense of humor - eight items per humor skill. It is possible to determine the total score for the sense of humor, but the scores of the six individual humor skills can also be evaluated (Ruch & Heintz, 2018).

While a sense of humor is a personality trait (Ruch, 2010), studies nevertheless show that it can be changed or cultivated (McGhee, 2010a; Ruch et al., 2018). Chapter 4 in this thesis shows that a humor intervention has a positive effect on the development of a sense of humor. While sense of humor remained stable over time in the intervention group (with a humor intervention), a decrease in the sense of humor was observed in the control group (without a humor intervention) (Bartzik et al., 2021).

Humor Styles

Many scholarly publications on the topic of humor describe so-called *humor styles*. Altogether, four different humor styles were described by Martin et al. (2003) in a multidimensional measurement instrument *(Humor Styles Questionnaire; HSQ)* in order to be able to investigate the different uses and functions of humor. These humor styles are *affiliative humor*, *self-enhancing humor*, *aggressive humor*, and *self-defeating humor*.

In conceptualizing the humor styles, Martin et al. (2003) distinguished whether humor is used to enhance oneself or to enhance one's relationships with other individuals. The use made of the humor styles can be divided into intrapersonal and interpersonal. Intrapersonal humor styles are self-enhancing and self-defeating humor, while affiliative and aggressive humor are interpersonal humor styles (Kuiper, 2016).

(1) Affiliative humor is used to improve relationships with other individuals and (2) self-enhancing humor is used to improve oneself. (3) Aggressive humor is when someone uses humor to enhance themselves at the expense of other individuals, while (4) self-defeating humor is used to enhance relationships at one's own expense (Martin et al., 2003).

Self-enhancing and affiliative humor include the positive aspects of the sense of humor and the negative aspects of the sense of humor are found in aggressive and self-defeating humor (Kuiper, 2016). It has been shown that males have significantly higher values than females in the use of aggressive humor, but no difference in the frequency of use could be found for affiliative, self-defeating, and self-enhancing humor (Ruch & Heintz, 2016). In the same study by Ruch and Heintz (2016), small negative correlations were reported between age and affiliative, aggressive, and self-defeating humor, whereas age and self-enhancing humor were positively correlated with each other. Relationships can be reported between happiness and the different humor styles. Happiness and optimism showed positive correlations with self-enhancing and affiliative humor and negative correlations with self-defeating and aggressive humor (Ford et al., 2016). Another study also showed the positive correlation between optimism and self-enhancing and affiliative humor, but no negative correlation between optimism and aggressive and self-defeating humor. It has also been shown that happier individuals tend towards positive humor styles (Ford et al., 2016). Self-enhancing and affiliative humor correlates positively with positive affect but shows no correlation with negative affect. While self-defeating and aggressive humor is positively correlated with negative affect, there is no correlation with positive affect (Edwards & Martin, 2014). Further, the study by Edwards and Martin (2014) showed positive correlations between self-enhancing as well as affiliative humor

and negative correlations between self-defeating as well as aggressive humor with resilience. Humor styles were also examined in the work context and it was found that the positive humor styles self-enhancing and affiliative humor were positively associated with optimism as well as with occupational self-efficacy and job satisfaction. The negative humor style, self-defeating humor, showed a negative association with optimism, occupational self-efficacy, and job satisfaction. A negative association of occupational self-efficacy has also been shown with the negative humor style aggressive humor. Regarding cognitive and affective irritation, positive associations have been reported for the negative humor styles and negative associations for the positive humor styles (Scheel et al., 2016).

Humor as a Character Strength

Research frequently considers humor as a single construct, but humor is also a part of the character strengths research focus of Peterson and Seligman (2004), who have described a total of 24 different character strengths, which add up to a total of six virtues (wisdom, courage, humanity, justice, temperance, and transcendence).

Humor as a character strength is assigned to the virtue of transcendence. Transcendence can be defined as "strengths that forge connections to the larger universe and provide meaning" (Peterson & Seligman, 2004, p. 30). Humor as a character strength is described as something playful that can be demonstrated by an individual's enjoyment of laughing, teasing others, making jokes, thereby making other people smile, and always looking on the bright side of life (Peterson & Seligman, 2004).

Humor as a character strength has relationships with sense of humor as well as with the six sense of humor skills (Müller & Ruch, 2011). A study by Edwards and Martin (2014) investigated the relationships of humor as a character strength with the categories *Happiness*, *Ways to Happiness*, *Resilience*, and *Morality*. Positive correlations were shown in the "Happiness" category between humor as a character strength and positive affect and satisfaction with life. In the category "Ways to Happiness", a positive correlation was shown with pleasure. At the same time, positive correlations were shown between humor as a character strength and resilience and internalization "Morality". Internalization morality is a private moral identity of individuals that is linked to their own well-being (Edwards & Martin, 2014). Humor as a character strength was found to have a general effect on job performance, team-level performance, and organization-level performance. However, humor as a character strength had

no effect on individual performance (Harzer et al., 2021).

Humor and Stress

Many studies in humor research have looked at humor as a coping strategy for dealing with stress (Martin & Lefcourt, 1983; McGhee, 2010a, 2010b, 2016; Mesmer-Magnus et al., 2012; Putz & Breuer, 2017; Scheel, 2017b).

Humor has a buffering effect against stress and the potential mechanisms for this include change of affect, change of perspective, distancing from the problem, and coping (Scheel, 2017b). Humor increases positive emotions and these positive emotions are incompatible with stress. Additionally, humor helps to view a stressful situation as less threatening and as more of a challenge (McGhee, 2010b).

Stress became particularly well known through the researcher Hans Selye, who found in experiments with rats that the adrenal glands enlarge and the thymus diminishes in size as a result of different strains or stressors (Selye, 1936). An example definition of stress derived from the *Transactional Model of Stress and Coping by* Lazarus and Folkman (1984) might be:

> "Psychological stress is a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being." (Lazarus & Folkman, 1984, p. 19).

A study by Martin and Lefcourt (1983) investigated if a sense of humor has a stress-buffering effect. It was shown in five out of a total of six results that humor had a moderating effect on the relationship between negative life events and current mood disturbance. Higher humor values among participants resulted in weaker relationships with negative life events and current mood disturbance. It was moreover observed that participants with many negative life events and low mood disturbance reported high humor values. A meta-analysis examined the benefits of positive humor in the work context. In addition to improving work performance, cohesion, health, and coping effectiveness, it was found to reduce burnout and stress (Mesmer-Magnus et al., 2012). Three studies by Fritz et al. (2017) showed that humor has negative effects on stress caused by stressful life events. For example, the first of these, with a total of 22 participants with fibromyalgia syndrome, showed that humor led to reduced stress and also reduced physical symptoms throughout the day and at bedtime. Due to the small number of

participants in that first study, another study (study 2) was conducted by Fritz et al. (2017) on a total of 109 students. There participants were asked to describe a negative or traumatic event from the past three years and finally rate their humor as a personality trait and describe their humor styles. The results of the second study confirmed that humor (as a personality trait, self-enhancing, and affiliative humor) is negatively related to stress and that humor has a stress-buffering effect. The third study by Fritz et al. (2017) also showed that humor has a stress-buffering effect. One hundred and five participants were asked about humor as a personality trait and humor styles at two measurement time points (measurement time 1: One month - and measurement time 2: Three months after the terrorist attacks of September 11, 2001). Affiliative humor reportedly had a stress buffering effect at measurement time 1.

Interestingly, not every humor style seems to be negatively related to stress. A study showed that aggressive humor has a positive relationship with stress in the work context (Avtgis & Taber, 2006). It may also be that some studies have found no relationship between humor and stress at all because no distinction was made between positive and negative humor (McGhee, 2010b). However, there are many studies that show the negative relationship between humor and stress and also describe humor as a coping strategy (Martin & Lefcourt, 1983; McGhee, 2010a, 2010b, 2016; Mesmer-Magnus et al., 2012; Putz & Breuer, 2017; Scheel, 2017b) and in medical science in particular, humor has been much studied and used.

Humor in the Care and Medical Context

As described above, the term humor was originally used in medicine (Jouanna & Allies, 2012) and to this day continues to be much researched in medical science (Bennett, 1995). Humor in the medical context is still often ignored even though it has been successfully used in children's hospitals (Leufgen, 2014), and despite the many positive effects on patients and medical staff (e.g., Bennett, 2003; Greenberg, 2003; Wanzer et al., 2005).

Humor is an important resource in nursing interaction in the medical field (Narwal & Gangadharan, 2017) and can be understood as a protective factor to cope with stress (McGhee, 2016; Mesmer-Magnus et al., 2012; Wanzer et al., 2005). The use of humor can produce positive emotions that are inconsistent with the simultaneous experience of stress (McGhee, 2010b). Research shows that humor can reduce the stress hormone cortisol (Savage et al., 2017), alleviate perceived stress, and simultaneously increase the blood marker chromogranin A, which is associated with experiencing "positive stress," also known as eustress (Toda et al.,

2007). Warner (1991) showed that nurses in training use humor as a cognitive and behavioral strategy to cope with stressful person-environment conditions.

Particularly prominent in the medical field as regards humor is the use of clinic clowns. A clinic clown has the role of actively using humor in interactions with patients, for example, to calm patients and imbue them with strength (Raviv, 2014). The use of clinic clowns leads to a reduction of stress and anxiety in children and their parents when children are admitted to hospital (Sridharan & Sivaramakrishnan, 2016). In a review by Lopes-Júnior et al. (2020) including a total of 24 studies, children and adolescents undergoing medical examinations reported less anxiety due to the presence of a clinic clown and the review further shows that the presence of a clinic clown can reduce stress, fatigue, and pain. Finally, the authors conclude that clinic clowns can improve the psychological well-being of patients. In an interview with 12 parents, it was found that a clinic clown creates a positive emotional state, leads to an affirmative environment (e.g., creates a joyful and calming atmosphere), and also creates a better connection between parents and children (A. K. J. Tan et al., 2014). However, not only patients benefit from the use of clinic clowns in their daily work, but also the medical staff. Out of 35 medical employees, 32 reported that a clinic clown helps them to do their work better. Out of 35 medical employees, 33 reported that the clinic clown should be used more often in the hospital context, and also that the use of clinic clowns helps the medical employees (32 out of 35 medical employees) to reduce their stress at work (Gomberg et al., 2020).

In addition to the use of clinic clowns, it has been shown that humor has many positive functions in the medical field. For example, humor can protect against burnout among medical staff because humor has a stress-buffering effect. This stress-buffering effect of humor can also be demonstrated in patients who use humor as a coping strategy to deal with anxiety and frustration due to illness. In addition, humor can help patients temporarily forget their pain (Bennett, 2003).

In the interaction between medical staff and patients, humor can improve communication and increase mutual trust (Greenberg, 2003; Sousa et al., 2019). Trust between the medical staff and patients is especially important because without trust humor is less readily tolerated (Tanay et al., 2013). In interaction with patients, humor can be used as an “ice-breaking” method if the situation allows it. Therefore, humor is also referred to as a complex intervention in the nursing context that requires cognitive and creative skills (Greenberg, 2003). Given that trust is an especially important factor for the use of humor in the medical context (Tanay et al., 2013), it is even more important that medical staff be trained in the topic so that they know when humor can and cannot be used (Beck, 1997; T. Tan & Schneider, 2009). In a study on nurses by Wanzer

et al. (2005), the various humor communication strategies for coping were examined in the nurses' daily work routines. The nurses most frequently used verbal humor, which can also be described as word play. Verbal humor is a clever way to use humor and includes telling jokes, using sarcasm, poking fun at others, and making jokes about oneself. An example would be:

> "... our assistant head nurse is a blonde and we'll say, ''She is having a blonde moment, and she has many!'' Also, this nurse thinks she is super nurse so we will call her ''Flo'' short for Florence Nightengale." (Wanzer et al., 2005, p. 116)

General humor was used second most frequently by nurses in their daily work. General humor, according to Wanzer et al. (2005, p. 116), is "Communication that emphasizes intensity, dynamism, and emotionality and includes general references to being friendly, enthusiastic, positive, optimistic, and happy." Nurses reported using general humor to relieve patient anxiety, to poke fun at events in the work context, and to improve the mood of colleagues. In third place, the nurses used low humor, which is applied situationally and spontaneously. Low humor can be understood as silly or absurd behavior or communication (Wanzer et al., 2005). Examples given of low humor are:

> "I often make silly comments just to break the ice; I walked around carting him like I was going to drop him; I raised my hand and may ask a totally stupid question and one that is totally off the subject being discussed; I will I use clowning techniques." (Wanzer et al., 2005, p. 116)

Other humor communication strategies mentioned in the study include nonverbal humor, laughing, funny props (items that can create humor; e.g., a funny calendar), or finding a person whom you find amusing (Wanzer et al., 2005).

The same study also identified eight different stressful situations in the work context that elicit humor in nurses. The stressful situations, by frequency of mention, were: Patient care (e.g., washing patients or assisting patients), general stress (nurses did not cite a specific reason for perceived stress), problems with colleagues (e.g., doctors or other nurses), deteriorating health and death, patient and family anxiety, difficult patients who need extra attention or behave uncooperatively, other nurse situations (e.g., meetings or trainings), and, finally, mistakes that happen while working (Wanzer et al., 2005).

Humor is also used in psychiatric-psychotherapeutic practice as training to complement the classical psychotherapeutic or pharmacotherapeutic interventions. This addition of humor to

the classical treatment plan is useful because humor can be understood as a protective factor and patients with certain disorders, such as depression, burnout, schizophrenia, anxiety disorders, and autism, have problems understanding humor (Falkenberg et al., 2013). The special humor training for psychiatric-psychotherapeutic practice by Falkenberg et al. (2013) aims to help patients understand humor as a resource for coping with stress, to use humor as a positive-emotional mood regulator, and to connect with other individuals (Falkenberg et al., 2013).

This section reported that humor is an important construct with many positive effects for patients and medical staff. In this thesis, Chapters 3 and 4 refer to the nursing profession, so the next section briefly introduces it.

Nursing

Everyone is probably familiar with the nursing profession from personal experience and has been in contact with nurses in various situations. This section will briefly introduce the profession of nursing and its activities and challenges.

In Germany, there has been only one training program for nurses (*German title: Pflegefachmann / Pflegefachfrau*) since the year 2020. The current training includes the three previous training programs: Health care and nursing, health care and pediatric nurse, geriatric nurse (Bundesministerium für Familie, Senioren, Frauen und Jugend, n.d.). The tasks of nurses vary, and an overview is provided by the Federal Employment Agency (*German title: Bundesagentur für Arbeit*). The tasks of nurses include caring for and looking after sick people and those in need of care (e.g., helping with food intake, hygiene, and personal hygiene), carrying out activities ordered by doctors (e.g., drawing blood and administering infusions), and assisting with medical examinations. In addition, nurses perform administrative and organizational tasks (e.g., writing nursing reports) in the medical field (Bundesagentur für Arbeit, n.d.). It should be noted that this is not an exhaustive list of nurses' duties in their daily work.

In the field of nursing, patients are the center of activity with their individual expectations, experiences, and vulnerabilities during the nursing process. The health needs of patients are described as multidimensional and always changing due to society and/or new technologies (Narwal & Gangadharan, 2017). The profession of nursing is described as very challenging and at the same time rewarding (Narwal & Gangadharan, 2017). One frequent reason why nurses

have chosen the profession is their desire to help others (Marcinowicz et al., 2016) and helping patients during the healing process is fulfilling (Narwal & Gangadharan, 2017). The interview study by Gilbert et al. (2020), showed in detail that caring for patients can make one satisfied and happy. A quote from a participant regarding happy moments in the nurse-patient relationship in dementia care was:

> "He smiles when he sees me, holds out his hand and seems happy to see me...it makes me feel happy that he trusts me. I love it...I want to do what I can to help him..." (Gilbert et al., 2020, p. 6)

However, the nursing profession faces many challenges or stresses in the working day. Daily work stresses include noise exposure, the risk of infection in the workplace, conflicts and hostility between nurses and other staff, quantitative, emotional, and physical work demands (Simon et al., 2005).

It was shown in the study that noise exposure in the sense of environmental noise is a stressor (Simon et al., 2005). This environmental noise increased from 57 dB(A) to 72 dB(A) during the day and from 42 dB(A) to 60 dB(A) at night between 1965 and 2005 (Notbohm & Siegmann, 2012). The review article by Khademi and Imani (2015) showed that in the majority of publications examined, the specification of the World Health Organization (WHO) (mentioned in the review article) for 35 dB(A) at night and 40 dB(A) during the day, cannot be adhered to. Intelligibility of speech can be impaired by a noise exposure of 55 dB(A), and with a further increase in noise exposure, the probability of loss of concentration and an increase in the probability of errors increases (Notbohm & Siegmann, 2012). During surgeries, peak noise levels of 120 dB(A) were reported in one study, and noise levels of 100 dB(A) could be measured 40% of the time during orthopedic and neurosurgical operations (Kracht et al., 2007). Sources of noise in hospitals may include medical equipment, alarms, telephones, beepers, or human conversations (e.g., rounds) (Delaney et al., 2017; Notbohm & Siegmann, 2012; Tsiou et al., 1998).

A further factor causing high stress is that nurses are exposed to a high risk of infection in their daily work (Simon et al., 2005). Through daily handling of bodily fluids, such as blood, nurses are at risk of contracting human immunodeficiency virus (HIV) or hepatitis C (Simon et al., 2005). Especially in the intensive care unit, nurses feel severely burdened by the risk of infection. For example, out of 811 nurses, 70% reported feeling burdened by the risk of infection, whereas nurses on a normal ward rated the burden of the risk of infection lower at

47.3% (*n* = 1,180) (Simon et al., 2005). In a study on nurses in Vietnam, it was found that those who were confident that they could successfully protect themselves against HIV or hepatitis B / hepatitis C infection were more likely to care for infected patients (Ishimaru et al., 2017). Because not all nurses are willing to care for HIV-infected patients, a positive safety culture in hospitals could lead to an increase in willingness to care for infected patients (Ishimaru et al., 2017). Infection with the coronavirus (*Severe acute respiratory syndrome coronavirus type 2 - SARS-CoV-2*) and the associated impact on family, work, and society, can also be considered a stressor (Sahashi et al., 2021).

Another stressor in the nursing context can be interpersonal relationships (Simon et al., 2005). Simon et al. (2005) investigated tensions and hostility between nurses and other staff in the nursing context. In hospitals, the relationship with care providers and the hospital's own administration in particular was seen as rather strained (Simon et al., 2005). This was also evident in another study in which work relationships, such as those with other nurses or physicians, were found to be stressful (Wanzer et al., 2005).

Quantitative demands are also daily stressors in the nursing context (Simon et al., 2005). By quantitative demands, Simon et al. (2005) refer to the amount of work to be accomplished during a shift. The authors asked participants (1) how often they lacked time to complete all tasks, (2) whether participants could take breaks when they wanted, (3) whether they had to work very quickly, (4) whether workloads were unevenly distributed so that work accumulated, and (5) whether they had enough time to talk with patients. The result showed that the quantitative demands in hospitals (Mean = 61; out of a maximum of 100) are particularly high in Germany - also in comparison with other European countries (Simon et al., 2005). It has been shown in another study that the workload of nurses is psychologically demanding and at the same time associated with pressure to complete tasks within a certain time limit (Umansky & Rantanen, 2016). A study on 216 nurses in a hospital in Ghana showed that a heavy workload was positively associated with job stress (Kokoroko & Sanda, 2019). In a qualitative study, it was observed that the tough time pressure experienced can lead to a sense of failure, as instead of high-quality care, only basic care is possible in the daily work routine (Dierckx de Casterlé et al., 2020).

> "There's nothing worse than someone wanting to talk to you for a moment, and you have to say, 'Actually, I don't have time, because I have to do this and that ... ' And it's getting worse. [...] you increasingly have to do ever more work with ever fewer people. And that, somewhere, has its consequences (silence)." (Dierckx de Casterlé et al., 2020, p. 984)

In particular, excessive quantitative demands are associated with burnout, lead to increased absenteeism, and increase the intention to leave the profession (Simon et al., 2005).

In addition to the quantitative demands of the nursing profession, the physical demands can also be described as a strain (Simon et al., 2005). This includes, for example, moving, repositioning, or carrying patients with and without assistive devices, assisting in dressing patients and assisting with eating, as well as moving patients' beds (Simon et al., 2005). The high physical demands can lead to musculoskeletal disorders, which may manifest in neck, shoulder, and back pain (Trinkoff et al., 2003). Musculoskeletal disorders, along with respiratory illnesses and mental illnesses, are among the most common illnesses in the nursing profession and are particularly common there compared to other professions (Drupp & Meyer, 2020).

Another potential stressor in the nursing profession is the emotional demands of confronting death, illness, aggressive and unpleasant patients (Simon et al., 2005). In one study, nurses reported their first experiences with death, most of which occurred during training. The nurses in that study reported differing perspectives regarding this experience with death. Some nurses described the experience of death as a learning experience for the profession, while other nurses felt guilty and experienced helplessness and stress (Kent et al., 2012).

In the interview study by Marcinowicz et al. (2016), a nurse reported that she did not believe that the profession of nursing is so difficult and emphasized that this profession is underestimated. In a study by Dewanto and Wardhani (2018) on nurses in five different private hospitals, turnover rates were found to range from 12% to 34% and that the main factors influencing high turnover were working conditions (e.g., salary, communication between hospital management and nurses, and feeling unsafe), personal reasons (e.g., pregnancy), or job offers (other hospitals or government organizations). The high turnover rates in this study had several consequences for patients, the remaining nurses, physicians, and the hospital. In summary, the high turnover rate leads to a loss of trust and satisfaction, service suffers, nurses in the hospital complain of increased workload, and further, nurses do not want to keep on training new nurses. Stress is one reason nurses want to leave their profession (Choi & Kim, 2020). Work stress is also a predictor of burnout in nurses (Khamisa et al., 2017; Schmitz et al., 2000) and burnout increases health problems among nurses (Khamisa et al., 2015).

As reported in this section, the nursing profession can be very challenging (Simon et al., 2005). At the same time, the great benefits of the nursing profession are probably known to most people, because probably almost everyone has already had some form of contact with the

nursing profession. A study showed that the nurses surveyed viewed their profession as having a positive benefit for society (Deutscher Gewerkschaftsbund & ver.di, 2018), and nurses are even described as systemically relevant (Bundesministerium für Familie, Senioren, Frauen und Jugend, 2020). From the report by the Federal Ministry for Family Affairs, Senior Citizens, Women and Youth (Bundesministerium für Familie, Senioren, Frauen und Jugend, 2020) it can be seen that since the COVID-19 pandemic (*Coronavirus disease 2019 – COVID-19*), attention has been drawn to the work of nurses and one young professional summarized the increase in attention to the nursing profession from his point of view. Prof. Dr. Renate Stemmer, as chairperson of the German Society for Nursing Science (*German title: Deutsche Gesellschaft für Pflegewissenschaft e.V.*) commented on the nursing profession during the COVID-19 pandemic and its future importance in the report by the Federal Ministry for Family Affairs, Senior Citizens, Women and Youth (Bundesministerium für Familie, Senioren, Frauen und Jugend, 2020). The following quote was freely translated from German by the author of this thesis:

> "The Corona crisis has drawn immediate attention to the importance of nursing to health care. However, the importance of nursing care for the health status of the population is significant not only in times of crisis, but also in general. The task now is to work together to promote structures so that the potential of care is actually called upon, used in a targeted manner and further developed in a forward-looking way." (Bundesministerium für Familie, Senioren, Frauen und Jugend, 2020, p. 11)

If we consider the benefits to society (Bundesministerium für Familie, Senioren, Frauen und Jugend, 2020; Deutscher Gewerkschaftsbund & ver.di, 2018) and contrast this with the current working conditions or work stressors (Deutscher Gewerkschaftsbund & ver.di, 2018; Simon et al., 2005), it can be assumed that there is a need for action to optimize working conditions for nurses, as many nurses want to leave the profession due to the working conditions (Hornung, 2013). Overall, only 23% of nurses (n = 1,260) reported that they would be able to do the job without limitations until retirement under the current working conditions in nursing, but with better working conditions, their confidence in their ability to do a good job until retirement increased (Deutscher Gewerkschaftsbund & ver.di, 2018).

It is important to prepare nurses well for the working conditions in the profession, because, especially in the future, demographic changes may change the nursing profession (Hornung, 2013). Patient numbers are increasing due to demographic change, and fewer and fewer nurses want to work in the profession (Bundesagentur für Arbeit, 2017, 2018, 2020; Hornung, 2013).

Not only are patient numbers increasing, but the proportion of older employees will also increase in the future, and the nursing profession in particular has an extremely large number of young nurses, as those in middle and old age often leave the profession prematurely (Hasselhorn et al., 2005).

Another global challenge is digitalization (Wolf & Strohschen, 2018) and healthcare must also face this challenge (Meyer auf'm Hofe & Blaudszun-Lahm, 2020). Even though digitization offers opportunities for the future, it can also bring risks (Kubek, 2020). For example, fears may arise among nurses that they may be replaced by robots or that their own values that led to their choice of profession are no longer compatible with a digitized nursing environment, and there is also a risk that the time resources required for a successful digital transformation in the nursing sector will not be available under the current working conditions (Kubek, 2020).

If we consider the challenges of demographic change and digitalization posed to the healthcare sector, we can assume that there is a need for action. This thesis addresses how stress in healthcare can be reduce by using humor, understood as a resource (for an overview see Chapter 2). This thesis also addressed the possibility of improving the work situation in the nursing profession by increasing flow experience and decreasing stress in the healthcare context through humor.

The next section of this thesis introduces flow experience in general and in relation to work, describing in more detail the relationship between flow experience and stress, and flow experience and humor.

Introduction to Flow Experience

Most of us are familiar with the phenomenon of engaging in an activity and being completely focused, forgetting about time, and happy to do it.

> "Your concentration is very complete. Your mind isn't wandering, you are not thinking of something else; you are totally involved in what you are doing. Your body feels good." (Csikszentmihalyi, 1975, p. 39)

The phenomenon described is flow experience, initially proposed by Csikszentmihalyi (1975) in his book "*Beyond boredom and anxiety*." The first studies on flow experience were conducted with dancers, basketball players, chess players, and mountain climbers, and intrinsic

motivation was found to lead to higher levels of satisfaction in performing activities than external rewards (Csikszentmihalyi, 1975).

Flow is described as a pleasant and rewarding state of total absorption during the performance of activities, and is facilitated by clear feedback, clear goals, and a balance between demands and abilities (Csikszentmihalyi, 1975). Flow experience is characterized by various components. These include, for example, a modified perception of time, involvement and enjoyment, concentration, reduced reflective self-consciousness, autotelic experience (intrinsic motivation), and the feeling of control (for a more detailed overview see: Barthelmäs & Keller, 2021; Landhäußer & Keller, 2012).

Peifer and Engeser (2021) categorized the various components of flow research into three core components of flow experience. These core components are *Perceived demand-skill balance*, *Enjoyment*, and *Absorption* (see **Figure 1.2**). Peifer and Engeser (2021) classified the components as experience of clear goals, experience of unambiguous feedback, experience of challenge-/demand-skill balance, feeling of control, and experience of coherent, noncontradictory demands under the first core component "Perceived demand-skill balance". These authors classified the components autotelic nature, intrinsic nature, and enjoyment under the second core component "Enjoyment," and the components centering on attention, loss of self-consciousness, fusion of action and consciousness, distortion of the temporal experience of time, and absorption under the third core component "Absorption". Based on this conceptualization of flow into the three core components, the following definition for flow experience by Peifer and Engeser (2021) can be described as follows:

> "... flow can be defined as the enjoyable experience of full absorption in an activity in which the demands are perceived as optimally compatible with one's skills." (Peifer & Engeser, 2021, p. 424)

Flow is an everyday phenomenon that can be experienced in leisure and work contexts (Csikszentmihalyi, 1975). The relevance of flow in the work context has been discussed in various publications (Bartzik et al., 2020; Fullagar & Delle Fave, 2017; Fullagar & Kelloway, 2009; Peifer & Wolters, 2017, 2021) and will be further explained in the following section "*Flow at Work*". The next parts of the section "*Introduction to Flow Experience*" will moreover present the relationship between flow experience and stress and finally the current state of research on flow experience and humor.

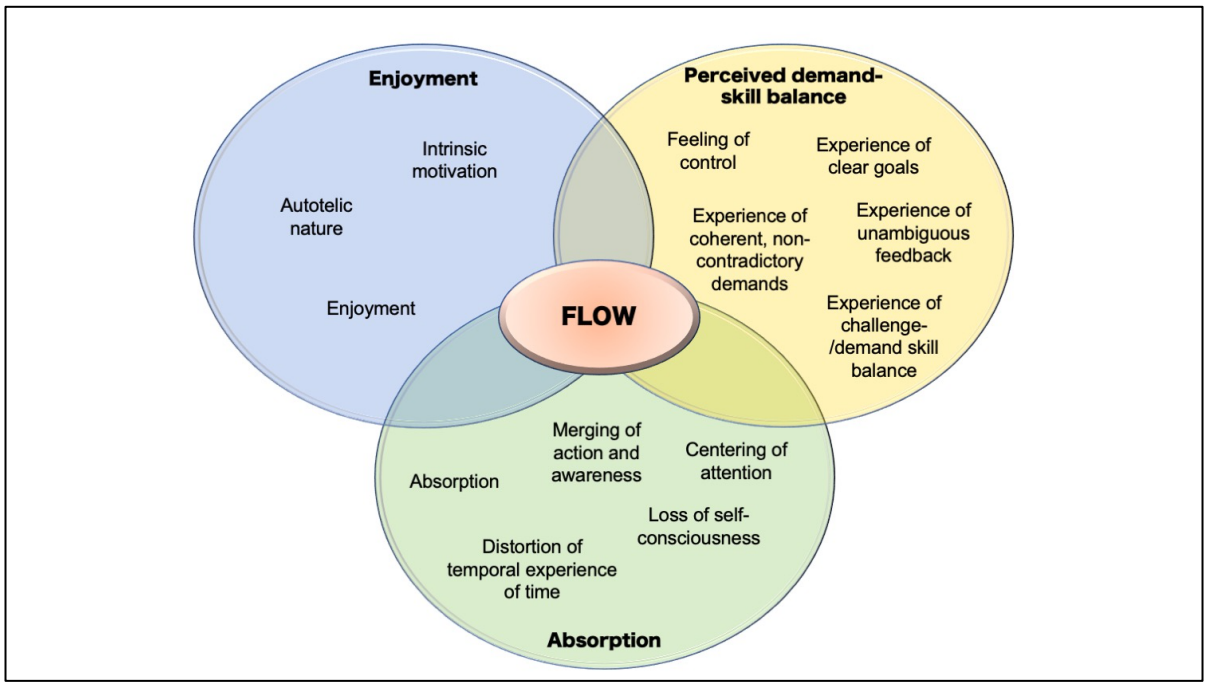

FIGURE 1.2 | The three core flow components by Peifer and Engeser (2021).

Flow at Work

Flow is often associated with games, such as chess or basketball, but it is also experienced at work (Csikszentmihalyi, 1975). It can be shown that flow is experienced more frequently at work than during leisure time (Csikszentmihalyi, 1997; Csikszentmihalyi & LeFevre, 1989). In the study by Csikszentmihalyi and LeFevre (1989) a total of 78 participants from different occupational fields (e.g., blue-collar workers, management and engineering, ...) were asked about their flow experience spread over the day. The study was conducted for a total of one week. It was found that flow is experienced at work during various activities (e.g., typing, fixing equipment, doing paperwork or, talking about problems) and more frequently than during leisure time. When considering the domain of work, some relationships between flow experience and important work-related constructs, such as performance, well-being, creativity, and stress, can be shown (Bartzik et al., 2020; Peifer & Wolters, 2017, 2021).

Several studies have already demonstrated that experiencing flow improves quantitative and qualitative performance (Bartzik et al., 2020; Christandl et al., 2018; Demerouti, 2006; Engeser & Rheinberg, 2008; Peifer, Schönfeld, et al., 2020; Peifer & Wolters, 2017, 2021; Peifer & Zipp, 2019). Peifer and Zipp (2019) investigated the effects of multitasking behavior on flow and subjectively perceived performance in the work context. In their study, with 60 participants

and a total of 494 measurement points, a moderate correlation between flow and subjectively perceived performance was reported as well as an effect of flow on performance in a multilevel analysis. A study by Demerouti (2006) observed that individuals who experience flow more frequently achieve better performance in accomplishing tasks that are contractual and part of the job description (in-role performance) and also show higher performance in activities at work that are not expected and therefore performed voluntarily (extra-role performance). An activity of extra-role performance could be e.g., supporting colleagues or willingness to work overtime.

Research shows that well-being can be enhanced by flow experience (Bartzik et al., 2020; Demerouti et al., 2012; Fullagar & Kelloway, 2009; Maeran & Cangiano, 2013; Peifer, Syrek, et al., 2020; Peifer & Wolters, 2017, 2021; Rivkin et al., 2018). A direct positive relationship between flow and well-being was shown in a study on unfinished tasks, flow, and well-being (Peifer, Syrek, et al., 2020). In the diary study by Demerouti et al. (2012) with a total of 83 participants, data on flow and energy at the end of a workday were collected twice a day for a total of four days. It was found that the participants were more energetic at the end of the day if they had experienced flow during their working hours. In another diary study with 90 participants over ten working days, flow mediated the relationship between affective commitment and day-specific well-being (Rivkin et al., 2018).

In addition to improving performance and well-being, flow experience is related to creativity (Csikszentmihalyi, 1996; Csikszentmihalyi & LeFevre, 1989; MacDonald et al., 2006; Zubair & Kamal, 2015). Flow and creativity showed a positive correlation and, interestingly, a negative correlation was shown between creativity and nonflow. At the same time there was a significant difference in creativity when a participant was in flow or nonflow. In this study the authors defined nonflow as states of anxiety, boredom, and apathy (Csikszentmihalyi & LeFevre, 1989). The relationship between flow and creativity was also demonstrated in the area of music composition among music students. The more flow was experienced while composing, the more creativity was reported (MacDonald et al., 2006). In another study, flow experience was shown to be a strong predictor of the emergence of creativity in employees (Zubair & Kamal, 2015).

An important work-related variable is stress. Stress at work is a frequent cause of illness and leads to periods of absence from work (TK, 2016). Flow and (high) stress have been shown to be negatively associated with each other (Bartzik et al., 2020, 2021; Peifer & Wolters, 2017, 2021). Further explanations of flow and stress follow in the section "*Flow and Stress*".

Flow in the Healthcare Context

Flow experience has been researched in the healthcare context and has been shown to have positive effects on work and positive effects for nurses (Bringsén et al., 2011; Burke et al., 2016; Martínez-Zaragoza et al., 2017; Zito et al., 2016). However, the research on flow experience in the healthcare sector is still very limited (McQueen et al., 2021).

How often is flow experienced in the hospital and what is flow directly related to? The flow experiences of 17 assistant nurses and 14 registered nurses were elicited using the experience sample method (Bringsén et al., 2011). In this study, the authors distinguished between flow situations and nonflow situations. From a total of 497 observations, the results showed that flow experiences were reported in 57 observations (11.5%). Some participants reported no flow experience during work at any measurement point and other participants reported up to 55% flow experience across all measurement points. In addition, positive relationships were found between flow situations in the nursing context and medical care activities (specific medical care for patients), cognitive resources (concentrated, inventive, interested, dedicated, efficient), and taking breaks. According to the authors, one possible reason why so little flow was experienced in this study could be to the problematic work design as well as work management in the hospital work environment (Bringsén et al., 2011).

An exploratory study of 224 nurses in a Turkish hospital showed by means of hierarchical regression analyses that higher flow values in nurses resulted in better work outcomes (self-rated job performance, vigor, dedication, absorption, and efficacy) as well as higher positive affect (Burke et al., 2016). In another study by Zito et al. (2016), further correlations and positive effects of flow with work-related variables were reported. In their study, Zito et al. (2016) investigated whether flow experience acts as a mediator between (1) job demands and (2) job resources on exhaustion. For this purpose, Zito et al. (2016) surveyed 279 nurses working in a hospital. This study showed several positive correlations between flow experience and job resources measured as supervisors' support (r = .26) and job autonomy (r = .38) and negative correlations between flow experience and exhaustion (r = -.54), job demands measured as emotional dissonance (r = -.27), and patients' demands (r = -.19). Furthermore, it could be shown that flow experience had a direct negative effect on exhaustion and that flow as a mediator decreases exhaustion in the relationship (1) job resources and exhaustion and (2) job demands and exhaustion (Zito et al., 2016).

Flow experience in the healthcare sector has positive effects on nurses' health (Martínez-Zaragoza et al., 2017; Zito et al., 2016). Nursing in particular has high stress and burnout levels

(Khamisa et al., 2015, 2017; Schmitz et al., 2000; Simon et al., 2005). The positive effects of flow on nurses' health were shown by a structural equation model in a study involving 282 nurses (Martínez-Zaragoza et al., 2017). In addition, the study by Martínez-Zaragoza et al. (2017) found positive effects of flow on approaches to coping and personal accomplishment.

In this section, the first research results could be shown as to how flow acts in the healthcare sector although there is preliminary evidence of how the flow experience can be fostered (Ludwigs et al., 2020; Peifer & Wolters, 2017, 2021). I am not aware of any study actively fostering flow in the healthcare sector. Nevertheless, there are indications from various studies of a need for future research, as well as practical implications for promoting flow experience in the health sector (Burke et al., 2016; Martínez-Zaragoza et al., 2017; McQueen et al., 2021; Zito et al., 2016). As briefly described in the "*Flow at Work*" section, there are negative relationships between flow and (high) stress (Bartzik et al., 2020, 2021; Peifer & Wolters, 2017, 2021) and due to high stress levels among nurses (Khamisa et al., 2015, 2017; Schmitz et al., 2000), flow could help reduce the subjective experience of stress and transform stress into flow (Bartzik et al., 2020; Peifer, 2012; Peifer & Tan, 2021). In the next section, the current state of research on flow and stress is described in more detail.

Flow and Stress

Interestingly, flow was observed particularly frequently in the context of stressful situations, such as, for example, rock climbing (Csikszentmihalyi, 1975), illegal graffiti spraying (Rheinberg & Manig, 2003), or teaching in school (Weimar, 2005).

In Csikszentmihalyi's (1975) "*Model of the Flow State,*" the stress experienced when demands exceed a person's capabilities is called anxiety. Early in flow research it was reported that stress can be enjoyed by experiencing flow (Csikszentmihalyi, 1975).

> "The results suggest that anything one does can become rewarding if the activity is structured right and if one's skills are matched with the challenges of the action. In this optimal condition, people enjoy even work, extreme danger, and stress." (Csikszentmihalyi, 1975, p. xiii)

Studies have shown that flow is most likely to be experienced at a moderate level of arousal, while too high a level of arousal inhibits flow (Peifer, 2012; Peifer et al., 2014, 2015; Peifer &

Tan, 2021). Flow and the stress hormone cortisol, as well as activation of the sympathetic nervous system, show an inverted u-shaped relationship (Peifer et al., 2014).

In a study by Peifer et al. (2015), participants received either 20mg of hydrocortisone or a placebo tablet before playing a computer game. If participants received the hydrocortisone at the measurement time point (t_1), they received a placebo at the measurement time point (t_2) and vice versa. The results of this study showed that taking hydrocortisone had a negative effect on flow experience.

The idea that stress can be transformed into flow (Csikszentmihalyi, 1990; Donner & Csikszentmihalyi, 1992) is described in the *Transactional Model of Stress and Flow* (Peifer, 2012; Peifer & Tan, 2021). The Transactional Model of Stress and Flow (Peifer, 2012; Peifer & Tan, 2021) is based on the *Transactional Model of Stress and Coping* (Lazarus & Folkman, 1984), in which stress is understood as a transactional process arising from the interaction of person and environment, which is controlled by a cognitive appraisal process. In the primary appraisal, individuals evaluate if the situation is a threat, loss, or challenge. In this primary appraisal, personal goals, needs, and resources are relevant in making the evaluation. If the situation is evaluated as a challenge, flow may result, but if the result of the evaluation is a threat or loss, stress may result. During the secondary appraisal, the individual evaluates if their resources suffice to cope with stress. If sufficient resources are available, flow can be experienced. Primary appraisal and secondary appraisal can be re-appraised during a reappraisal process and stress can be transformed to flow (Peifer, 2012; Peifer & Tan, 2021).

A potential resource for transforming stress into flow within the Transactional Model of Stress and Flow (Peifer, 2012; Peifer & Tan, 2021) is humor. A further explanation of humor as a resource within the Transactional Model of Stress and Flow (Peifer, 2012; Peifer & Tan, 2021) is presented in Chapter 2 and in the following section "*Flow and Humor*," the current state of research on the relationship between flow and humor will be described.

Flow and Humor

The research so far on the combination of humor and flow experience is very limited. A paper on flow and humor by Meany (2007) considered the interrelationships between flow, humor, and anxiety and illustrated in a figure that the three constructs overlap. In the paper, the author also asked whether flow can be achieved through humor, and in the hypothesis, the reduction of anxiety through humor plays a central role. Meany (2007) summarizes in his paper that

humor can reduce anxiety as a "state," calling anxiety a "trait" rather than a readiness to experience stress. Further, he describes that if anxiety is considered a state in the "Model of the Flow State" by Csikszentmihalyi (1975), then the reduction of anxiety is possible and so also an increase in flow. However, he also argues that anxiety in flow theory is an outcome variable from the interplay of challenge and skill and that the variables anxiety and boredom would have to be reconfigured. However, he also argues that anxiety in flow theory is an outcome variable from the interaction of challenge and ability, and that the variables of anxiety and boredom would need to be reconfigured so that the manipulation of anxiety and boredom, and challenge and ability can achieve flow experience (Meany, 2007). However, when humor and flow are considered at the physiological level, it can be shown that humor can reduce the stress hormone cortisol, and flow is most probably experienced when cortisol levels are moderate (Peifer et al., 2014), and when the cortisol levels are too high, flow experience is inhibited (Peifer et al., 2015). Reducing the stress hormone cortisol through humor could help achieve moderate levels rather than high levels of cortisol. A detailed explanation of how humor can promote flow experience is presented in Chapter 2.

Hardly any studies have statistically examined the relationship between humor and flow. One study showed a correlation between humor and flow with a correlation of $r = .25$ (van Oortmerssen et al., 2020). The study by van Oortmerssen et al. (2020) examined whether humor moderates the negative effects of hindrance demands on the relationship between challenging demands and flow experience during work. The hypothesis could not be confirmed, but the addition of humor into the statistical model showed that more variance in flow experience could be explained. In their discussion, the authors stated as a possible reason for rejecting the hypothesis that rumors of restructuring were circulating in the company during the period of the survey and this may have given rise to negative feelings among some employees. Thus, according to the authors, humor could not be effectively used as a coping strategy (van Oortmerssen et al., 2020).

In a study by Plester et al. (2015), workplace fun was examined and divided into three types: *organic fun*, *managed fun*, and *task fun*. Organic fun is spontaneous interactions between employees while managed fun consists of activities strategically planned by management to achieve organizational goals. Task fun was defined by the authors as flow experience. They claimed that task fun can be increased by the workplace climate. The findings of this study permit the conclusion that some participants enjoyed their work tasks and the fun that resulted from them, but the importance of humor was also reported several times in the results on task

fun. At the same time, a closeness between task fun and organic fun (spontaneous interactions between employees) was described in the study.

> "We do actually work but at the same time we have fun, so I think it is in the culture […] if I'm having fun with the work I'm doing then I am going to be doing better simply because I am a bit more engaged (Mike, 32, Telephone Salesperson, Financial Company)." (Plester et al., 2015, p. 390)

In a study by Plester et al. (2015), participants also reported that experiencing flow meant personal fun for them. At the same time, Plester et al. (2015) describe flow experience according to Csikszentmihalyi (1975), that is, as a construct associated with play and fun. According to McGhee (2010a), a playful attitude can be understood as intrinsically enjoyable. He argues that playfulness can lead to greater enjoyment while performing activities:

> "When you become more playful, you also become more spontaneous and get more enjoyment from what you´re doing at the moment." (McGhee, 2010a, p. 17)

To make a connection from McGhee's (2010a) quote to flow experience, note that he explicitly names the moment and additionally the term enjoyment. Here it is important to note that "enjoyment" is called a component of flow experience (Bakker, 2008; Peifer & Engeser, 2021). In a study on playfulness in young adults, individuals with a tendency toward playfulness were found to be more able to enjoy their environment (Barnett, 2007). In this study by Barnett (2007), focus groups were formed to describe the characteristics of highly playful and not at all playful individuals and finally 15 different attributes of playful individuals were identified. Barnett (2007) proposed a definition of "playfulness" which includes many humorous facets (e.g., funny, joking, teasing, ...). The definition of playfulness according to Barnett (2007) is:

> "Playfulness is the predisposition to frame (or reframe) a situation in such a way as to provide oneself (and possibly others) with amusement, humor, and/or entertainment. Individuals who have such a heightened predisposition are typically funny, humorous, spontaneous, unpredictable, impulsive, active, energetic, adventurous, sociable, outgoing, cheerful, and happy, and are likely to manifest playful behavior by joking, teasing, clowning, and acting silly." (Barnett, 2007, p. 955)

In addition to the predisposition to playfulness, according to the self-determination model of flow by Bakker and van Woerkom (2017), a playful work design (e.g., creating to-do lists and setting a timer for completion, or setting specific goals within a task) could also help to promote

flow while working (Bakker & van Woerkom, 2017). In an interview study, participants frequently reported experiencing fun as a form of humor at work while reporting more engagement at work (Plester & Hutchison, 2016), which is closely related to the construct flow (Salanova et al., 2010). An example quote from the interview study by Plester and Hutchison (2016) is:

> "I would feel better if there was more humour and fun. You can still be professional because jokes or fun ends and then you focus again, but you know it will happen and you are looking forward to that little bit of humour, it does make a great workplace […] The day that you have a lot of laughs- that day I feel good, great and I have achieved that, confirmed policies, put through leads that I wouldn't normally not do and you feel great about yourself. Fun is like a cup of coffee it energises you. ..." (Plester & Hutchison, 2016, p. 341)

In this quote, on days when there is more laughter at work, the person feels good and performs better. In the interview, the people probably report experiencing flow (Plester & Hutchison, 2016). Another quote from the study by Plester and Hutchison (2016) shows that humor and seriousness at work are not mutually exclusive and in addition that humor makes people happy, which in turn can lead to relaxation and flow experience:

> "I'm quite serious about my job. If I'm working I concentrate at work and there is a job to do I want to get it done – I'm quite dedicated and conscientious – but if I can't take a break and have a bit of a laugh and fun to relax then I'm not happy. If I'm happy then I'm relaxed, engaged and enjoying it…" (Plester & Hutchison, 2016, p. 340)

From both quotes from the study by Plester and Hutchison (2016) it can be observed how important humor in the workplace could be for the experience of flow and leaving open the assumption that the use of humor can foster flow experience. As described at the beginning, the literature in the field of flow and humor is very limited. Therefore, further studies are needed focusing on the relationship between flow experience and humor. This thesis is relevant to such research because it extends the limited research on flow and humor and the possibility to reduce stress. The publications in Chapters 2, 3, and 4 extend the research on flow and humor, and Chapter 5 in this thesis provides an overview for future research.

Aims of this Thesis

So far only very few studies on the topic of flow and humor have been presented, healthcare being particularly little addressed. The aim of this thesis is to contribute to the expansion of research in the field of flow and humor and to investigate the potential of humor as a resource for fostering flow experience and alleviating stress in the work context of nurses. This thesis presents a theoretical chapter presenting a model for facilitating flow experience and reducing stress through humor as a resource (Chapter 2), a questionnaire study conducted during the extraordinarily stressful time of the COVID-19 pandemic (Chapter 3), and an intervention study including training in humor and a before-after comparison was shown with an intervention and a control group (Chapter 4).

The aim of Chapter 2, *"On the Relationships Between Humour, Stress and Flow Experience—Introducing the Humour-Flow Model,"* was to clarify the relationship between humor, flow, and stress and to ascertain the importance of humor as a resource for individuals and organizations. For this purpose, the "*Humor-Flow Model*" was developed, which was derived from the *Transactional Model of Stress and Flow* (Peifer, 2012; Peifer & Tan, 2021).

The aim of Chapter 3, "*Negative Effects of the COVID-19 Pandemic on Nurses can be Buffered by a Sense of Humor and Appreciation,*" was to show how humor can act as a resource, as hypothesized in the "Humor-Flow Model" (Chapter 2). The COVID-19 pandemic was a stressor in the health sector causing several negative effects on nurses (e.g., decreased flow experience and increased stress). The aim of this chapter is to show that humor has a buffering effect against the negative effects caused by the stress factor "COVID-19 pandemic" on flow experience and stress in the healthcare sector.

The aim of Chapter 4, "*Care for Joy: Evaluation of a Humor Intervention and Its Effects on Stress, Flow Experience, Job Enjoyment, and Meaningfulness of Work,*" was to investigate whether humor could be fostered by a humor intervention. Chapter 2 described theoretically how humor as a resource can facilitate the flow experience while reducing stress in the "Humor-Flow Model." Chapter 3 investigated whether humor as a resource has a buffering effect on a stressor. The intervention study with nurses in training in Chapter 4 aims to show that humor can be trained and to replicate the evidence from Chapter 3 that humor can foster flow experience and reduce stress.

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Chapter 2: On the Relationships Between Humour, Stress and Flow Experience–Introducing the Humour-Flow Model

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M.B. and C.P. conceived of the presented idea. M.B. developed the theory. C.P. supervised the concept. M.B. and C.P. discussed the results and contributed to the final manuscript.

Abstract

In this chapter, we will focus on the link between humour, stress and flow experience at the workplace. Research shows that humour acts as a protective factor and can be used as a coping strategy to deal with stress. There are two potential pathways for how humour affects stress: (1) The use of humour fosters positive emotions which may change the appraisal of stress; thus, it may buffer effects of stressors on the experience of stress. (2) Positive emotions in general, as well as concepts closely related to humour such as fun and playfulness in particular, were found to support flow, the experience of being fully absorbed in a challenging task. When people are fully absorbed in what they do, this helps them overcome potential hindrances in spite of unfavourable and stressful circumstances. In line with this, flow was found to support active and persistent coping with a challenging task and has been described as a "powerful sustainer of coping". This is also supported by studies on the physiology of flow. The interplay of humour and flow and their buffering effects on stress can be illustrated in the Transactional Model of Stress and Flow, ultimately leading us to propose the *Humour-Flow Model*. The model further suggests that the use of humour and the active support of flow experience lead to positive outcomes for individuals. In the context of work, those positive effects on individuals may also positively affect organisations. Promoting humour and flow at the workplace is, thus, a promising approach to support successful coping with challenging work demands.

Keywords: Humour - Flow experience - Stress - Coping - Humour-Flow Model

Introduction to Humour and Stress

Humour is much more than just the everyday understanding of being funny. Humour can be found as a construct within Positive Psychology (Müller & Ruch, 2011; Ruch et al., 2010) and is defined as: "a broad, multifaceted term that represents anything that people say or do that others perceive as funny and tends to make them laugh, as well as the mental processes that go into both creating and perceiving such an amusing stimulus, and also the emotional response of mirth involved in the enjoyment of it" (Martin & Ford, 2018, p. 16). Furthermore, humour can be described as part of the 24 character strengths of Peterson & Seligman (2004). They describe the character strength humour as something playful, a person who likes to laugh, tease other people and make jokes, thereby making other people smile, always looking at the bright side of life. Another concept in the context of humour is the personality trait "sense of humour" (Martin & Ford, 2018). Sense of humour is defined by Martin (2003, p. 315) as

> "…a habitual behavior pattern (tendency to laugh frequently, to tell jokes and amuse others, to laugh at other people's jokes), an ability (ability to create humor, to amuse others, to "get the joke," to remember jokes), a temperamental trait (habitual cheerfulness), an aesthetic response (enjoyment of particular types of humorous material), an attitude (positive attitude toward humor and humorous people), a world view (bemused outlook on life), or a coping strategy (tendency to maintain a humorous perspective in the face of adversity)."

Sense of humour is divided into different facets, which are referred to as humour habits (McGhee, 2010a) or humour skills (Heintz & Ruch, 2018). The facets are (1) enjoyment of humour, (2) laughter, (3) verbal humour, (4) finding humour in everyday life, (5) laughing at yourself, and (6) humour under stress (Ruch & Heintz, 2018).

There are different humour styles that are used for different purposes: These include (1) self-enhancing humour, which is used to enhance oneself, (2) affiliative humour, which is used to enhance one's relationships, (3) aggressive humour, which is used at the expense of others to enhance oneself, and (4) self-defeating humour, which is used to enhance relationships at one's own expense (Martin et al., 2003). In addition to the function of building relationships with others, humour can be used as a coping strategy in dealing with stress

The term "stress" can be attributed to Hans Selye, who is also called the founder of stress research (Selye, 1936). According to Lazarus and Folkman (1984) stress is „a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being" (Lazarus & Folkman,

1984, p. 19). Stress can occur for a wide range of reasons, such as from environmental factors (noise, time pressure), social factors (conflicts in the family or at work) or personal factors (personality trait such as neuroticism) (McGrath, 1981). In their *Transactional Model of Stress and Coping*, Lazarus and Folkman (1984) suggest that a stressor can be evaluated as positive, negative or irrelevant (= primary appraisal). If the stressor was assessed as negative, the stressor is next evaluated with regards to the potential to cope with the demands of the stressor, given the person's resources. If the demands exceed the resources, this leads to stress.

When considering the effects of stress in the working context, it becomes apparent that stress is highly relevant for the health of employees (Ganster & Schaubroeck, 1991). Especially long-term stress is an indirect or direct factor that triggers illness. In a study by a German health insurance provider with a total of 1200 participants, 31% of the participants have reported feeling stressed or burnt out. At the same time, only half of the people who feel frequently stressed state that they are at least in a good state of health, and 22% of the frequently stressed people state that they are in a poor state of health (TK, 2016). Stress is also shown to have a negative influence on performance, motivation and satisfaction with one's professional career (Jamal, 1984; Nisar & Rasheed, 2020).

Accordingly, successful strategies to cope with stress are important resources in today's work environments. Coping behaviour is defined by Lazarus and Folkman (1984, p. 141) as "constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person". A wide variety of coping strategies are used, such as acceptance, turning to religion, positive reinterpretation or seeking social support (Carver et al., 1989). Another coping strategy, on which we focus in this chapter, is humour. As will be shown in the following sections, there is first but scarce evidence on the effects of humour on stress and on humour as a coping strategy. However, to the best of our knowledge, no model yet exists, which explains the interplay of humour and stress. Accordingly, we here present a conceptual paper in which we aim to elaborate potential mechanisms of the interplay between humour and stress with the aim to present a testable model, called the *Humour-Flow Model*.

Humour as a Coping Strategy

Humour can be understood as a protective factor that helps to successfully cope with stress (McGhee, 2016; Mesmer-Magnus et al., 2012; Wanzer et al., 2005). Martin and Lefcourt (1983)

studied the buffering effects of sense of humour on stressful experiences and found that humour acts as a moderator between negative life events and mood disturbance. In their study, people with a high sense of humour showed less mood disturbances than people with low sense of humour. Warner (1991) investigated humour as a coping strategy in nurses in training and used the Transactional Model of Stress and Coping (Lazarus & Folkman, 1984). She showed that humour can be integrated into the model and that nurses in training often used humour as a cognitive and behavioural strategy to deal with stressful person–environment relationships. A respective cognitive coping strategy is, for example, escalating the situation to the point of absurdity; a respective behavioural coping strategy is, for example, laughing with patients.

In a longitudinal study, it was found that self-enhancing humour reduces stress, but this stress-reducing effect could not be shown for the humour styles such as affiliative humour, aggressive humour and self-defeating humour (Cann & Collette, 2014). In a cross-sectional study by Putz and Breuer (2017) with a total of 118 employees, it was investigated how self-enhancing humour and affiliative humour affect the relationship between workload and perceived stress. It was found that people who used more self-enhancing humour reported less stress and that self-enhancing humour moderated the relationship between workload and perceived stress. However, this result could not be shown for affiliative humour. The authors argued that the different results for self-enhancing humour and affiliative humour are due to the fact that the two humour styles have different functions. Self-enhancing humour can be understood as an intrapersonal coping strategy to change one's emotional state and affiliative humour as an interpersonal communication strategy to build relationships.

In a total of three studies, Fritz et al. (2017) provided further evidence that humour is negatively related to stress and can have stress-buffering effects. In their first study, they investigated patients with a diagnosed fibromyalgia syndrome using a diary design over five days. They found a negative effect of dispositional humour on stress and also found that dispositional humour is negatively related to physical symptoms in the daily measurements. In their second study, students were asked about their biggest negative event of the last three years. The results revealed a high negative effect of dispositional humour and a moderate negative effect of self-enhancing and also affiliative humour on their self-reported stress ratings. Finally in study three, applying a longitudinal design with students after the 9/11 attack, authors found a buffering effect of humour on stress as experienced after 9/11. The authors assumed that through humour people perceive negative life events in a more positive light and at the same time as less

threatening. Thus, the *reappraisal* of stressors through humour seems to be a particularly effective mechanism in the stress-buffering effect of humour

Also during the Corona pandemic, during which very high levels of stress were reported (Islam et al., 2020; Muller et al., 2020), humour was found to be actively used by caregivers as a form of coping (Sun et al., 2020). Moreover, a study with employed students at a university showed that they very often used humour as a cognitive emotion regulation strategy (i.e. finding humour in the respective situation) in negative customer contacts or when they were angry (Diefendorff et al., 2008). In another study with nurses by Wanzer et al. (2005), different types of humorous coping strategies were presented. The authors were able to identify a total of 150 different humorous coping strategies from the nurses' reports. These coping strategies were summarised into the categories such as low humour (behaving stupidly, silly or absurdly in work-related situations), general humour (showing in communication that a person is friendly, optimistic and happy), non-verbal humour (non-verbal behaviour, e.g. smiling, eye contact or grinning), verbal humour (word puns, telling jokes or teasing others), impersonation (speaking in different voices or imitating a person), laughter (laughing or chuckling), seeking a person to use humour (seeking a person who is humorous and can create humour) and funny props (items that can create humour, such as humorous calendars, humorous cartoons or funny cards).

Also, at the physiological level, studies confirm buffering effects of humour on stress. For example, it was shown that the use of humour can reduce the stress hormone cortisol (see review by: Savage et al., 2017). Interestingly though, an experimental study by Toda et al. (2007) with an intervention group (watching a comic film) and a control group (watching a neutral film) showed that the stress marker chromogranin A *increased* in the intervention group while perceived stress *decreased*; in the control group, chromogranin A and perceived stress remained stable. The authors suggested that chromogranin A is a marker for positive stress (eustress; compare Selye (1976)) and that laughter can thus contribute to stress reduction.

To conclude this section, we can summarise that humour is a resource in stressful situations and can be used as a coping strategy to deal with stress.

Flow Experience as a Promoter of Coping

A positive experience that is associated with stress is the so-called flow experience. Flow according to Csikszentmihalyi (1975) can be understood as a positive and rewarding experience

of total engagement in an optimally challenging task. According to Peifer and Engeser (2021), the three core components of flow are absorption, perceived demand–skill balance and enjoyment. When people are fully absorbed, feel optimally challenged and enjoy what they do, this helps them overcome potential hindrances in spite of stressful circumstances (Peifer & Tan, 2021). In line with this, flow has been called a "powerful sustainer of coping" (Lazarus et al., 1980). The mechanisms that lead to stress or flow respectively are described in the *Transactional Model of Stress and Flow* (Peifer & Tan, 2021). The model is based on the Transactional Model of Stress and Coping (Lazarus & Folkman, 1984) and incorporates the idea that stress results if stressful demands from the environment and/or the task are evaluated as a thread or loss (primary appraisal) and if the coping resources are evaluated as insufficient (secondary appraisal). In line with Donner and Csikszentmihalyi (1992), the Transactional Model of Stress and Flow further suggests that flow experience results if the demands are instead evaluated as a challenge (primary appraisal) and if the available resources for coping with stress are evaluated as sufficient (secondary appraisal). In that case, all available resources are focused on coping with the stressor, leading to the enjoyable experience of being fully absorbed with an optimally challenging task. In line with the Transactional Model of Stress and Coping (Lazarus & Folkman, 1984), the model assumes that renewed evaluations in the primary and secondary appraisal can always be made, that is, switching between stress and flow is possible.

Empirical studies confirm that flow occurs in stress-relevant situations, such as during high-risk activities (Csikszentmihalyi, 1975; Rheinberg & Manig, 2003) or demanding work tasks (e.g. Csikszentmihalyi, 1975; compare Peifer & Wolters, 2021). Also, studies on the physiology of flow confirm a relationship of the two concepts: physiological indicators of arousal, which are highly pronounced during stress (e.g. sympathetic activation, cortisol), are found to be at least moderately pronounced during flow (e.g. Peifer et al., 2014, 2015). This led to the suggestion that flow is a moderate and (due to its enjoyable character) positive form of stress. Moreover, the physiological pattern that was identified as typical for flow is associated with consequences that are helpful for coping with stress (Peifer & Tan, 2021). More specifically, moderate sympathetic activation together with a parasympathetic coactivation was found to support a better adaptation to demanding situations (Berntson et al., 1991) and to active coping with high workload (Backs et al., 1999). Moderately elevated cortisol levels facilitate focusing on relevant information (i.e. selective attention), thereby shielding irrelevant information from

attention (Oitzl et al., 2010). Furthermore, cortisol leads to an increase in blood glucose and thus provides long-term energy resources for sustained coping (e.g. Gailliot et al., 2007).

Taken together, flow can be the resulting experience under stress-relevant conditions if the demands are evaluated as a challenge and resources are evaluated as sufficient for coping. During flow, people show an attention mode which is conducive to successful coping: All available resources will be focused on coping with the task at hand, while all irrelevant information will be shut out.

The Humour-Flow Model

Based on the Transactional Model of Stress and Flow as well as on the reported research on humour and stress and on flow and stress, we developed the "*Humour-Flow Model*" (**Figure 2.1**). The model describes two pathways, or mechanisms, which explain the stress-buffering effects of humour. In the first pathway, humour affects the primary and secondary appraisal of a potential stressor. In the second pathway, humour supports flow experience, which will then facilitate coping.

First Pathway Between Humour and Stress

The first suggested pathway is that the use of humour promotes positive emotions, which alter the primary appraisal (pathway 1a) and secondary appraisal (pathway 1b) of a stressor. Accordingly, humour buffers the effects of stressors on perceived stress via the elicitation of positive emotions.

In line with this assumption, empirical findings show that the use of humour leads to positive emotions (Cann & Collette, 2014; Robert & Wilbanks, 2012; Szabo, 2003) and to an increase in well-being (Cann & Collette, 2014; Crawford & Caltabiano, 2011; Proyer et al., 2010). In line with McGhee (2010b), we argue that positive emotions are hardly compatible with the perception of stress; thus, the use of humour and the simultaneous increase of positive emotions should reduce stress. This assumption is also supported by Martin and Ford (2018, p. 243), who argue that "Those with a greater tendency to use humor in coping with stress appear to appraise potentially stressful situations as more challenging rather than threatening…".

Also Robert and Wilbanks (2012) describe in their model *The Wheel Model of humor* that a positive humour event can trigger positive affect in an individual person. They further outline

that positive affect can lead to an emotional expression (e.g. laughter), which in turn can lead to emotional contagion and, therefore, contribute to a humorous environment. A humorous environment can be divided into short-term (humour episodes) and long-term (humour-supportive climate) consequences, both of them increasing the probability of the emergence of positive affect at the individual and group level. Therefore, humour not only leads to the possibility of coping with stress at the individual level, but through emotional contagion, humour is also a possible coping strategy at the collective level.

Taken together, we assume that the evaluation of a stressor is affected by a humorous attitude, so that positive emotions can emerge. The resulting positive emotions will lead to a more optimistic evaluation of the available resources and thus rather lead to the appraisal that coping resources are sufficient.

Second Pathway Between Humour and Stress

The second pathway is that humour increases the likelihood of flow experience and that flow in turn promotes an attentional state of full concentration on coping with the stressful situation.

There is first evidence that the use of humour can lead to flow experience (Bartzik et al., 2021; Meany, 2007; Plester et al., 2015; van Oortmerssen et al., 2020). For example van Oortmerssen et al. (2020) found a correlation between humour and flow and found that adding humour to a statistical model explained more variance in flow experience. A study with nurses in training also found support for an association of sense of humour with flow (Bartzik et al., 2021).

Some further studies which dealt with concepts that are related to flow or humour support those first findings on the relationship between humour and flow: For example, fun at work (a construct that overlaps with humour) was found to promote work engagement (a concept having large overlaps with flow experience (Plester & Hutchison, 2016)). These results where supported and illustrated in an interview study by Plester et al. (2015). Some interviewees reported that fun at work increases work engagement with positive results for work performance. Bakker and van Woerkom (2017) describe playful work design as a factor that supports flow at work. In the description of playful work design, the authors refer to the definition of playfulness by Barnett (2007). From this definition, the closeness to the construct of humour is obvious, as playfulness is defined as

> "… the predisposition to frame (or reframe) a situation in such a way as to provide oneself (and possibly others) with amusement, humor, and/or entertainment. Individuals who have such a heightened predisposition are typically funny, humorous, spontaneous, unpredictable, impulsive, active, energetic, adventurous, sociable, outgoing, cheerful, and happy, and are likely to manifest playful behavior by joking, teasing, clowning, and acting silly." (Barnett, 2007, p. 955).

Bakker and van Woerkom (2017) further point out that more research should be done in the area of playful work design in order to increase flow experience.

Moreover, there is evidence that humour promotes flow particularly in stress-relevant situations. For example, Meany (2007) suggests that humour can reduce anxiety, which may facilitate flow. This is in line with characteristics of the physiology of stress, humour and flow: During a state of stress, cortisol levels are high, which hinders flow experience (Peifer et al., 2015). Humour can reduce the stress hormone cortisol (Savage et al., 2017) and thus help to switch from flow-hindering high cortisol levels to flow-fostering moderate cortisol levels.

Taken together, first empirical evidence and evidence from related concepts suggest a positive relationship between humour and flow. Also, evidence suggests that humour promotes the likelihood of flow experience particularly in stress-relevant situations, as humour reduces anxiety and the stress-hormone cortisol, thus leading to a psychological and physiological state that is conducive for flow.

Further Predictions of the Humour-Flow Model

Flow Might Also Affect Humour

Vice versa, flow might also affect humour, resulting in a reciprocal relationship between humour and flow (see pathway 2; **Figure 2.1**). This reciprocal relationship is in line with Salanova et al. (2014), who found in a longitudinal study that the experience of flow and personal and organisational resources positively influence each other, resulting in an upward spiral (Salanova et al., 2014). Humour is a personal resource and could thus act as a trigger of such a positive upward spiral.

Positive Outcomes of Humour

As visualised in **Figure 2.1**, humour can have positive consequences for individuals. Humour promotes positive affect (Cann & Collette, 2014; Robert & Wilbanks, 2012; Szabo, 2003), increases well-being (Cann & Collette, 2014; Crawford & Caltabiano, 2011; Proyer et al., 2010)

and has a contagious effect on groups with regard to positive affects (Robert & Wilbanks, 2012). It was further shown that negative affect was reduced by the humour behaviour "cheerfulness" (Heintz, 2017) and that humour led to reduced anxiety and depressive symptoms (Menéndez-Aller et al., 2020).

Furthermore, a meta-analysis by Mesmer-Magnus et al. (2012) shows a positive relationship between humour and job satisfaction. Last but not least, humour was found to increase creativity (Eliav et al., 2017), which can be seen as a driving force in innovation processes (Cropley, 2006).

Such positive effects of humour will in turn lead to positive organisational outcomes. Increased job satisfaction of the employees is related to reduced absenteeism and fluctuation, to increased organisational commitment and to higher overall productivity (Judge et al., 2001; Mathieu & Zajac, 1990; Swider et al., 2011).

Also, more creative employees will promote organisational success (Zhou & Hoever, 2014).

Positive Outcomes of Flow

Studies show that flow experience is positively associated with positive affect (e.g. Fullagar & Kelloway, 2009), well-being (Bartzik et al., 2020; Peifer et al., 2020; Rivkin et al., 2018) and job satisfaction (Maeran & Cangiano, 2013). Also, flow is negatively associated with negative affect (Collins et al., 2009) and anxiety (Datu & Mateo, 2017).

In addition, flow was found to be positively related to indicators of short- and long-term performance (Bartzik et al., 2020; Christandl et al., 2018; Engeser et al., 2005), such as increased creativity (MacDonald et al., 2006) or in-role (contracted working tasks) and extra-role performance (e.g. voluntary completion of extra working tasks) (Demerouti, 2006).

Such positive effects of flow on the individual lead, in consequence, to positive organisational outcomes: Higher performance of the employees and their increased well-being and job satisfaction again lead to reduced absenteeism and fluctuation, to increased organisational commitment and to higher overall organisational productivity (Judge et al., 2001; Mathieu & Zajac, 1990; Swider et al., 2011).

Negative Outcomes of Stress

For individuals, prolonged stress can lead to health complaints and decreased mental well-being (Estryn-Behar et al., 1990; TK, 2016). On the organisational level, this in turn can lead to increased absenteeism from work, turnover intentions and fluctuation, which are linked to increased costs for organisations (O'Connell & Kung, 2007).

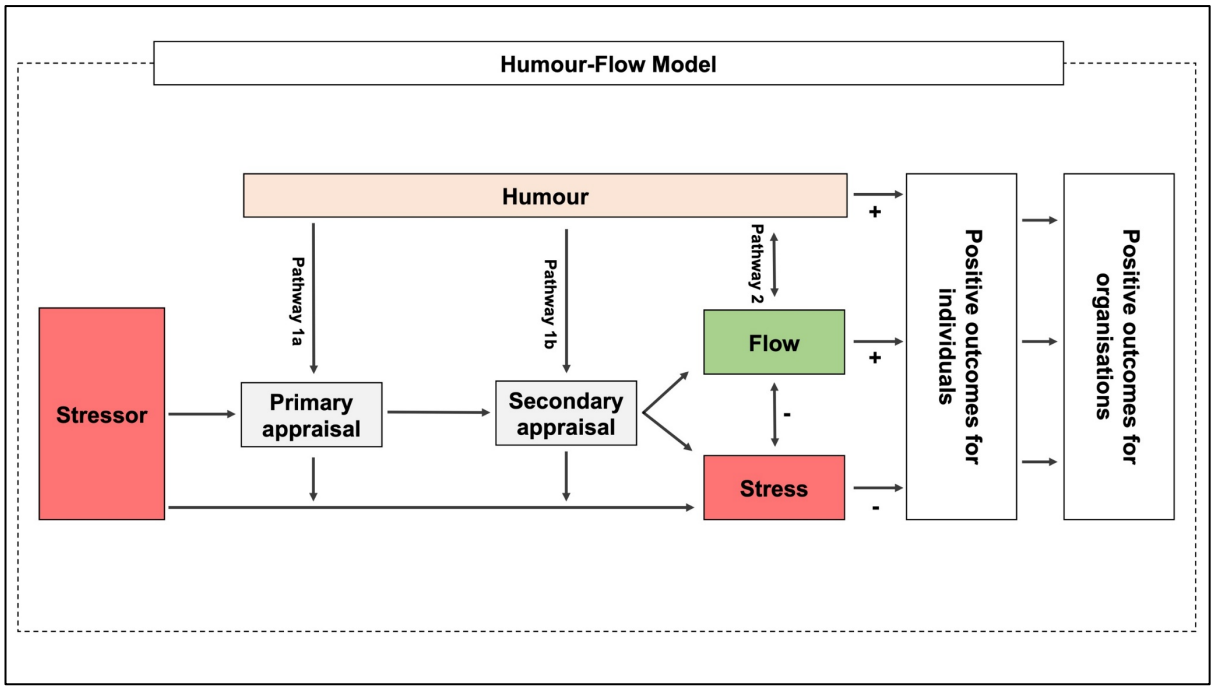

FIGURE 2.1 | The Humour-Flow Model.

Implications for Future Research and Practice

The Humour-Flow Model entails testable predictions about the interplay between humour, stress and flow experience. Future research should thus test these predictions, that is, effects of humour on the appraisal of stress and effects of humour via flow on reduced stress, as well as their positive outcomes at the individual and organisational level.

For practice, the predictions of the model suggest positive effects of humour and flow on individual and organisational outcomes. Accordingly, trainings that foster humour and flow are promising future workplace interventions. Studies confirm that humour training positively affects humour and furthermore that it leads to an increase in life satisfaction, well-being and resilience, as well as to a reduction in stress, depression and negative affect (Hofmann & Giuliani, 2019; Ruch & Heintz, 2018). Also, several interventions and work design factors exist

to foster flow at the workplace, and these can be implemented in organisations (for an overview see Peifer & Wolters, 2021).

Conclusion

First but scarce evidence exists on the interplay between humour, stress and flow experience. Existing studies suggest that humour can be an effective way to cope with stress and to increase flow. Thus, the aim of this chapter was to collect and report existing literature related to those concepts and to derive a model that predicts potential mechanisms in the interplay between humour, stress and flow. This chapter thereby extends the scope of prior research on humour and stress, as flow experience as a positive psychological concept has been introduced as a potential additional mechanism in the humour–stress relationship. The resulting Humour-Flow Model provides testable predictions for future research as well as implications for practice.

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Chapter 3: Negative Effects of the COVID-19 Pandemic on Nurses can be Buffered by a Sense of Humor and Appreciation

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Ethics approval and consent for participants

All procedures in this study were performed in accordance with the ethical standards of the German Psychological Society, of the 1964 Helsinki Declaration and its later amendments and were approved by the ethics committee of the Ruhr University Bochum (# 540, 612). Informed consent was obtained from all individual participants included in the study.

Author contribution statements

All authors conceived the idea presented. M.B. carried out the experiment. M.B. and C.P. developed the theory. M.B. and F.A. wrote the methods section. F.A. and M.B. conducted the analyses and wrote the results section. All authors collaborated on the discussion section. All authors discussed the results and contributed to the final manuscript. C.P. supervised the conceptualization and process of writing the paper.

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Minor formatting changes were made in this chapter, for example, to tables, citation style, presentation of statistics, or figures, in order to achieve a consistent formatting style throughout this thesis.

Abstract

Background: The first analyses of the various consequences of the COVID-19 pandemic show that the risk to nurses' psychological well-being is particularly high. As the pandemic and the demands imposed on nurses are not yet fully understood, there is a need to seek buffering factors to protect nurses' psychological health. In line with the earliest evidence, we hypothesize pandemic-related increases in perceived stress and decreases in the frequency of flow experiences, likewise in satisfaction with work, life, work performance, and well-being. As protective factors while dealing with pandemic-related stress, we suggest an individual`s sense of humor and perceived appreciation.

Methods: In June/July 2020 – during the first lockdown in Germany – participants completed an online-survey in which they were asked to rate their situation before the pandemic (retrospectively) and during the pandemic. Our sample consisted of 174 registered nurses (161 females, 13 males, $M_{age} = 40.52$), of whom 85 worked as public health nurses and 89 as geriatric nurses.

Results: During the pandemic, nurses felt more stressed, had fewer flow experiences, and were less satisfied with their work, life, work-performance, and well-being than before the pandemic. Sense of humor and the perceived appreciation of society and patients were confirmed as buffers of negative pandemic-related effects.

Conclusion: Our study contributes to the so far scarce knowledge on nurses' pandemic-related stress and well-being in combination with their resources. Moreover, we were able to identify sense of humor and appreciation as protective factors.

Keywords: COVID-19 - Sense of humor - Appreciation - Flow experience - Satisfaction - Health care nurses - Geriatric nurses

Introduction

At the end of 2019, the coronavirus (SARS-CoV-2) broke out in Wuhan (China) and quickly spread around the world. The outbreak of the coronavirus and its worldwide spread was considered by the World Health Organization to have reached the level of a pandemic in March 2020 (World Health Organization, 2020b). Since the beginning of the outbreak until 12/06/2020 (2:48 pm CET), 65,870,030 people have been confirmed to have been infected worldwide and 1,523,583 people have died as a result of the pandemic (World Health Organization, 2020a). Health care systems have been particularly severely affected by the COVID-19 pandemic. Therefore the nursing profession has come increasingly into focus. In Germany, these occupations are labeled as systemically relevant, meaning that even in such a worldwide crisis their work is indispensable. First analyses of the consequences of the COVID-19 pandemic confirm that the risk to nurses' psychological well-being is currently particularly high: Chinese nurses with close contact to infected patients were twice more likely to suffer from anxiety and depression than were non-clinical staff (Lu et al., 2020). A second study on nurses from 34 Chinese hospitals reported an alarming prevalence of depression (50.4%), anxiety (44.6%), insomnia (34%) and distress (71.5%), with the highest prevalence in frontline health care (Lai et al., 2020). Therefore, our study deals with the subjectively perceived psychological states of nurses before the COVID-19 pandemic compared to during the COVID-19 pandemic, focusing on perceived stress, frequency of flow experiences, work and life satisfaction, and satisfaction with work performance and wellbeing. We moreover look at the resources that help to deal with the special demands during these difficult times; more specifically, we are interested in factors protective against of these psychological states such as sense of humor and appreciation.

Stress

An important variable that should be considered in the context of care during the COVID-19 pandemic is stress. According to the transactional model of stress and coping by Lazarus and Folkman (1984), there is a primary appraisal of the stressor, in which the stressor is classified as positive, negative, or irrelevant for a person. In case of a negative assessment of the stressor, a secondary appraisal is carried out, which compares the available resources with the demands. If the demands exceed the available resources, the person perceives stress. There are correlations between somatic symptoms in nurses and their perceived stress (Gandhi et al., 2018), which makes it even more important to investigate the relationships between different

stressors in the care context and the subjective perceptions of stress. Another negative outcome of work-related stress is burnout, which also occurs among nurses (Khamisa et al., 2015; Schmitz et al., 2000). In the care context, numerous stressors, such as direct contact with patients, too little time to perform duties adequately or an uncongenial work environment have been identified as causing stress (McGrath et al., 2003). During the COVID-19 pandemic, additional stressors have been reported, such as the increased workload due to increased hygiene regulations and requirements to perform COVID-19 tests – or the psychological stressors related to the fear that family members will be infected (Maunder et al., 2003; Mertens et al., 2020). In line with this, over 80% of participants in a questionnaire study on nurses reported that they experienced stress during the COVID-19 pandemic (Islam et al., 2020). This finding was also confirmed by a review including 59 studies (Muller et al., 2020). In this study, we would like to add to this research, asking participants about their subjective stress experiences before and during the COVID-19 pandemic. Based on earlier research, we hypothesize that *the nurses will report an increase in perceived stress during the COVID-19 pandemic compared to before the COVID-19 pandemic (Hypothesis 1).*

Flow Experience

Another variable that is interesting to investigate is the frequency of flow experience. Flow is described as a pleasant and rewarding state of full absorption when performing activities which provide clear feedback, clear goals, and a balance between demands and abilities (Csikszentmihalyi, 1975). While there is a lot of research on flow in the work context (Bartzik et al., 2020; Peifer & Wolters, 2017), it has not so far been considered in the context of nurses. However, flow is associated with many positive work-related outcomes, such as increases in positive affect (Collins et al., 2009; Eisenberger et al., 2005; Fullagar & Kelloway, 2009) and decreases in negative affect (Collins et al., 2009). Flow is positively associated with job performance, job satisfaction, well-being, work engagement, organizational commitment, and also reducing the subjective perception of stress (Bartzik et al., 2020; Christandl et al., 2018; Peifer & Wolters, 2017; Peifer & Zipp, 2019; Rivkin et al., 2018). Besides these positive work-related outcomes, research shows some association of flow experience with stress (Peifer, 2012; Peifer & Tan, 2021). In particular, it was found that stress-related physiological indicators are related to flow in an inverted u-shaped way (Peifer, 2012; Peifer et al., 2014, 2015). This means that, compared to a condition of boredom or relaxation, flow is associated with moderate increases in stress-related physiological parameters. Higher levels of physiological activation

are again associated with lower levels of flow and are rather an indicator for stress. Due to the COVID-19 pandemic, nurses stress levels rose (Islam et al., 2020; Muller et al., 2020; Spoorthy, 2020; Temsah et al., 2020), so that the level of moderate physiological activation was most likely often exceeded. Accordingly, we suspect that the nurses experienced less flow in their daily work during the COVID-19 pandemic than before the COVID-19 pandemic. We hypothesize that *nurses experienced less frequent flow during the COVID-19 pandemic than before the COVID-19 pandemic (Hypothesis 2).*

Satisfaction with Work, Life, Work Performance, and Well-Being

Finally, in this study, the nurses' satisfaction with their work, lives, work performance and well-being before and during the COVID-19 pandemic was investigated. It may be that satisfaction with work changes for the worse due to stressful working conditions and new procedures for hygiene and COVID-19 testing. There is already evidence of impaired work satisfaction due to the COVID-19 pandemic (Möhring et al., 2020). We also postulate that satisfaction with life deteriorates because work satisfaction and life satisfaction are closely linked (Unanue et al., 2017). The first results during the COVID-19 pandemic show a decline in life satisfaction (Rogowska et al., 2020; Zacher & Rudolph, 2020). Similar effects are predicted for satisfaction with work performance. Caring for patients with COVID-19 may also have an influence on nurses' satisfaction with their level of well-being (Wu et al., 2020). Due to the risk posed by coming into contact with COVID-19 patients, nurses could be less satisfied with their well-being than they were before the COVID-19 pandemic. We hypothesize that the *nurses will report lower satisfaction with work (Hypothesis 3a), satisfaction with life (Hypothesis 3b), satisfaction with work performance (Hypothesis 3c), and satisfaction with well-being (Hypothesis 3d) during the COVID-19 pandemic than before the COVID-19 pandemic.*

Protective Factors

Due to their stress-protective effects found in earlier studies, we want to investigate appreciation and sense of humor as resources that could reduce the negative effects of the COVID-19 pandemic on nurses' perceived stress, frequency of flow experience, and their satisfaction with work, life, work performance and well-being.

Buffering Effect of Sense of Humor

The initial evidence shows that nurses successfully used humor as a coping strategy during the COVID-19 pandemic (Sun et al., 2020). The construct of humor is a concept from Positive Psychology (Ruch et al., 2010) and one of the 24 character strengths defined by Peterson and Seligman (2004). Sense of humor was found to be a protective factor against anxiety and depression (Menéndez-Aller et al., 2020) and was also found to be protective in adverse circumstances (Boerner et al., 2017). It can be defined as:

> "(…) a habitual behavior pattern (tendency to laugh frequently, to tell jokes and amuse others, to laugh at other people's jokes), an ability (ability to create humor, to amuse others, to "get the joke," to remember jokes), a temperamental trait (habitual cheerfulness), an aesthetic response (enjoyment of particular types of humorous material), an attitude (positive attitude toward humor and humorous people), a world view (bemused outlook on life), or a coping strategy (tendency to maintain a humorous perspective in the face of adversity)" (Martin, 2003, p. 315)

Sense of humor can be divided into six humor habits (Ruch & Heintz, 2018). These are: enjoyment of humor, laughter, verbal humor, finding humor in everyday life, laughing at yourself, and humor under stress (McGhee, 1996, 2010a). There is evidence that the use of humor can increase individuals' well-being (Cann & Collette, 2014; Crawford & Caltabiano, 2011; Proyer et al., 2010). Humor can moreover act as a coping strategy in the transactional model of stress and coping by Lazarus and Folkman (1984). Through cognitive appraisal and the resulting behavior, humor can be used as a coping strategy (Warner, 1991). The use of humor creates positive emotions (Cann & Collette, 2014; Robert & Wilbanks, 2012; Szabo, 2003) that are incompatible with stress and thus lead to coping (McGhee, 2010b). Fun and playfulness are described as factors conducive to flow in everyday work (Bakker & van Woerkom, 2017; Plester et al., 2015; Plester & Hutchison, 2016). Hence, we also expect positive effects of sense of humor on flow, although this relationship has not so far been investigated. We therefore hypothesize that *sense of humor, as a coping strategy, can serve as a buffer, which reduces the negative effects of the COVID-19 pandemic on perceived stress (Hypothesis 4a), frequency of flow experience (Hypothesis 4b), satisfaction with work (Hypothesis 4c), satisfaction with life (Hypothesis 4d), satisfaction with work performance (Hypothesis 4e), and satisfaction with well-being (Hypothesis 4f).*

Appreciation

One definition of appreciation is "acknowledging the value and meaning of something—an event, a person, a behavior, an object—and feeling a positive emotional connection to it." (Adler & Fagley, 2005, p. 81). The COVID-19 pandemic has focused attention on the healthcare sector, especially on nurses. Clapping from apartment balconies for nurses was established in many cities as a sign of appreciation, and there were also monetary bonuses for nurses. We assume that these signs of appreciation led to nurses having a subjective feeling of increased appreciation from society as well as from direct interaction with patients. In line with this, a qualitative study regarding the effects of the COVID-19 pandemic found that nurses reported they would work with a state of appreciation in the future (Sun et al., 2020). In a first step, we would like to add to this qualitative result and investigate quantitatively if health nurses' subjective perceptions of appreciation for their work has increased due to the COVID-19 pandemic. Based on the preliminary findings, we hypothesize that *subjective perceived appreciation among nurses' changes for the better during the COVID-19 pandemic (Hypothesis 5).*

Buffering Effect of Appreciation

While assuming that the perception of appreciation has changed for the better during the COVID-19 pandemic, we also suggest that this can act as a resource, buffering the negative effects of the COVID-19 pandemic. Supporting this assumption, it was be shown that managers' appreciation of their employees is positively associated with well-being and job satisfaction, and negatively associated with job-related depressive mood and sleep problems (Stocker et al., 2019). Feedback can be a form of appreciation. As shown in a meta-analysis, feedback has positive effects on performance, and this was especially the case with positive feedback (Kluger & DeNisi, 1996). One possible mechanism is the increase in self-efficacy (Peifer et al., 2020). Hence, our hypothesis is that *appreciation can serve as a buffer which reduces the negative effects of the COVID-19 pandemic on perceived stress (Hypothesis 6a), frequency of flow experience (Hypothesis 6b), satisfaction with work (Hypothesis 6c), satisfaction with life (Hypothesis 6d), satisfaction with work performance (Hypothesis 6e), and satisfaction with well-being (Hypothesis 6f).*

Methods

Participants

The sample was recruited through postings on social networks, especially in groups with public health nurses and geriatric nurses. We moreover contacted institutions with health care nurses and geriatric nurses directly via e-mail and asked them to disseminate information on the survey. The questionnaire was online from 06/01/2020 until 07/31/2020. In total 299 participants started to fill out the online questionnaire, but 125 did not complete it and were excluded from the analysis. The final sample consisted of 174 registered nurses (161 females, 13 males). Eighty-five worked as public health nurses and 89 as geriatric nurses. The participants had completed a three-year training program with a state examination (In our sample size, four public health nurses and 11 geriatric nurses were currently in training). Due to missing data and the exclusion of outliers on all variables involved in the analysis (+/- 2.5 *SD*) *n* varies between 152 and 174 for the different analyses. The mean age was 40.52 (SD_{age} = 10.75) and ranged between 18 and 62 years. Two participants skipped the question about their ages and 147 provided information about their professional experience. On average the participants had 18.65 years ($SD_{experience}$ = 10.90) of experience in their profession, the range being between one year and 43 years.

Procedure

During the COVID-19 pandemic, we created an online questionnaire that can be divided into five parts: (1) In the demography data section, we elicited demographic information on the participants (e.g., age, gender, work experience). (2) Next we asked about their sense of humor. (3) Then we introduced questions on subjective experience before the COVID-19 pandemic (t_1) with the following instruction: "*Now please put yourself in the time at the beginning of February this year before the corona pandemic. The year had already started a few weeks ago, Christmas and New Year's Eve were felt to be long gone. The weather was clearly too warm, too windy, too wet, and with too little sunshine for the taste of the meteorologists. There were the first evenings when it grew dark a little later. At work the daily business was in full progress...Please put yourself in the position you were in before the corona crisis, at the beginning of February 2020, and answer the following questions.*". (4) After the block of questions on subjective perception before the COVID-19 pandemic came questions on subjective perception during the COVID-19 pandemic (t_2). We introduced the section with the

instruction: "*Please revert to your situation in your everyday work during the corona pandemic and answer the following questions.*" (5) Finally, we asked three questions about concerns regarding the COVID-19 pandemic.

Measures

Self-constructed scales and items are provided in English and German in the **Supplementary Material - Table S3.1**.

Stress

We used three different measurements for mental stress. First, we used one single item ("How stressed did you feel?") to measure the participants' stress. They rated their stress levels on a 5-point rating scale from 1 = *not at all* to 5 = *very strong.* Second, stress was measured with the subscale emotional irritation of the *Irritation Scale* by Mohr et al. (2005). Participants rated the five items on a 7-point rating scale from 1 = *do not agree at all* to 7 = *totally agree.* One example item is "Even at home I often think of my problems at work". The reliabilities for the two measurement times were good (Cronbach's α = .84 (t_1) or .90 (t_2)). Third, we used the subscale for emotional exhaustion of the German version (*MBI-D*) by Büssing and Perrar (1992) of the *Maslach Burnout Inventory* (Maslach & Jackson, 1981). Participants were asked to rate nine items (e.g., "Working with people all day is really a strain for me") on a 7-point rating scale from 1 = *never occurred* to 7 = *occurred often.* The Cronbach's α were very good with .92 at t_1 or .93 at t_2.

Flow Experience

Flow experience was measured with the recently developed *Flow Frequency Scale* by Bartzik and Peifer (in preparation). The scale consists of ten items and can be divided into three subscales. These are: absorption (e.g., "How often did you experience at work that you were completely focused on what you were doing?"), perceived demand-skill balance (e.g., "How often did you experience at work that you could use your skills to the optimal extent"), and enjoyment (e.g., "How often did you experience at work that you felt joy in what you were doing"). Participants rated how often they had those experiences on a 6-point rating scale from 1 = *never* to 6 = *(almost) always.* We found good to questionable reliabilities for absorption (Cronbach's α = .62 (t_1) or .71 (t_2)), perceived demand-skill balance (Cronbach's α = .86 (t_1) or

.89 (t_2)), and enjoyment (Cronbach's α = .91 (t_1) or .94 (t_2)). Cronbach's α for the full scale was .93 at t_1 and .94 at t_2.

Satisfaction

Satisfaction was measured with four self-constructed single items – satisfaction with work, life, professional performance, and well-being. The participants rated their satisfaction on a 7-point rating scale from 1 = *extremely dissatisfied* to 7 = *extremely satisfied.* An example item is "All in all, how satisfied were you with your work?". The different points on the scale additionally provided smileys to support the decision.

Sense of Humor

To measure sense of humor we used the parallel form of the *Sense of Humor Scale* (*SHS-P*) by Ruch and Heintz (2018). The version used consists of 24 items rated on a 7-point rating scale from 1 = *strong disapproval* to 7 = *strong agreement*. Although the overall value of the scale (sense of humor), six subscales can be distinguished – enjoyment of humor (e.g., " I enjoy funny sketches"), laughter (e.g., "I like laughing, because it makes me feel good") verbal humor (e.g., "I often make funny comments"), finding humor in everyday life (e.g., "I see funny occurrences in the daily routine"), laughing at yourself (e.g., "If something embarrassing happens to me, I can laugh about it"), humor under stress (e.g., "Even in difficult situations my humor does not leave me"). Cronbach's α for the scale was .92. The Cronbach's α for the subscales varied between .71 and .84.

Appreciation

To assess appreciation, we developed two single items. The first item focused on appreciation experienced from the patients and the second item elicited appreciation experienced from society ("How much did you feel appreciated by the patients? / society?"). There was a 5-point rating scale from 1 = *not at all* to 5 = *very much.*

COVID-19 Pandemic Items

We constructed three items to measure the subjective consequences of the COVID-19 pandemic on a 6-point rating scale from 1 = *do not agree at all* to 6 = *totally agree*. An example item is "I was very concerned about my own health because of Corona.".

Workload During the COVID-19 Pandemic

We asked the participants about their actual workloads during the COVID-19 pandemic. The item was "Because of the COVID-19 pandemic I had to work…". Participants could choose between 1= *significantly less*, 2 = *less*, 3 = *just the same*, 4 = *more,* or 5 = *significantly more*.

Data Analysis

The statistical analyses were performed with IBM SPSS statistics package V26. For all analyses we used pairwise deletion. To test Hypotheses 1, 2, 3, and 5 we performed two-tailed paired t-tests. Due to the large number of participants, a normal distribution can be assumed according to the central limit theorem (Bortz & Schuster, 2011). We calculated Cohen's d_z for paired samples manually. Regarding Hypotheses 4 and 6, we wanted to ascertain if sense of humor and appreciation can buffer against the negative effects of the COVID-19 pandemic on perceived stress, flow experience, work and life satisfaction, and satisfaction with work performance and well-being. Here we calculated difference scores of the outcome variables (M_{during} - M_{before}) and performed linear regressions with sense of humor and the subscales and the difference scores on appreciation as independent variables. Therefore, we used linear regression models in SPSS.

Results

Descriptive Data and Intercorrelations

To consider the exceptional circumstances during the COVID-19 pandemic we asked some general questions about the participants' concerns. Participants were most concerned about the health of their family members and friends (M = 4.17, SD = 1.75). The fear of consequences to their own health was lower but still in the middle of the scale (M = 3.17, SD = 1.81). Concerns about their economic future were the lowest (M = 2.22, SD = 1.71). For an overview see **Table 3.1**.

Figure 3.1 shows the change in workload due to the COVID-19 pandemic. It is evident that over 66% of the respondents had significantly more work or more work than before the COVID-19 pandemic. Only about 16% reported that they had significantly less or less to do. About 18% reported that their workload did not change due to the COVID-19 pandemic.

TABLE 3.1 | Means, minimum, maximum, and standard deviation of the COVID-19 pandemic items.

Items	*n*	*Mean*	*Min.*	*Max.*	*SD*
Concerns about economic future	174	2.22	1.00	6.00	1.71
Concerns about the health of friends and family	174	4.17	1.00	6.00	1.75
Concerns about my own health	174	3.17	1.00	6.00	1.81

Note. COVID-19 pandemic items were measured on 6-point rating scale from 1 to 6.

When examining the descriptive data on sense of humor it was noticeable that the mean values were relatively high. Participants reported high values (M = 6.03, SD = 0.93) in particular on the subscale *laughter*. For an overview see **Table 3.2**. An overview of the intercorrelations is given in the **Supplementary Material** (**Table S3.2** to **S3.4**).

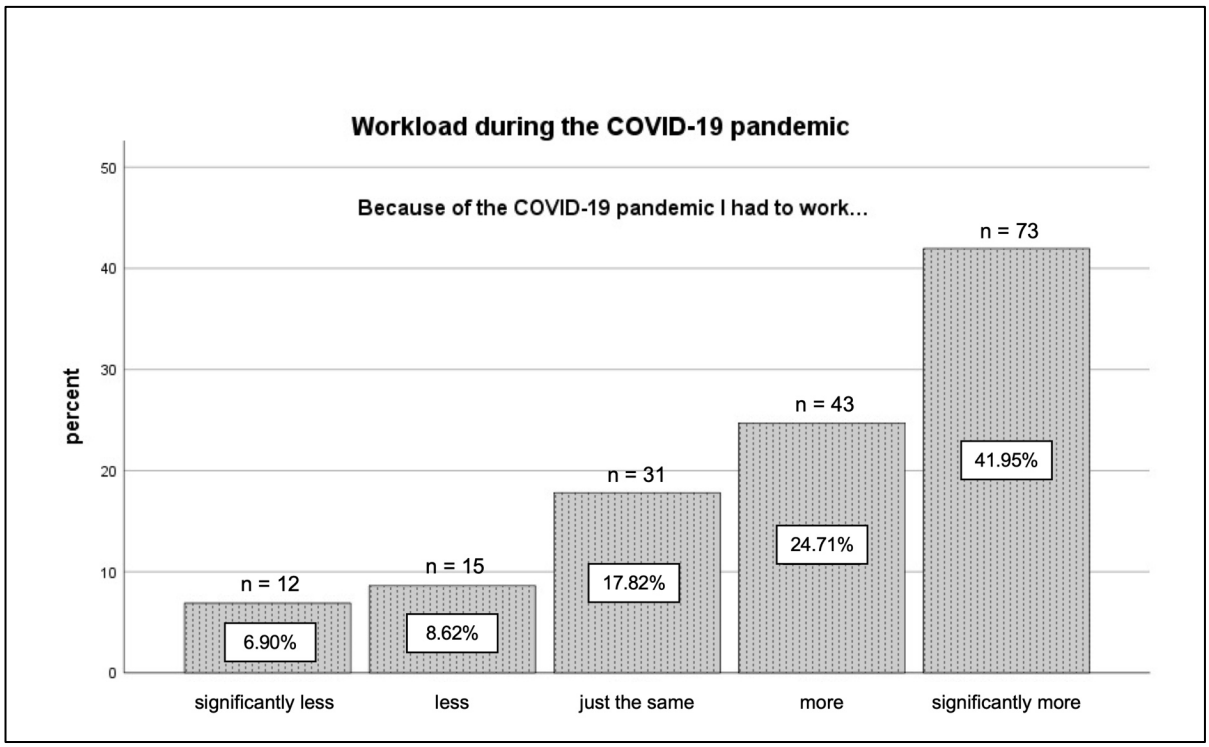

FIGURE 3.1 | Workload during the COVID-19 pandemic**;** Above the bars the frequencies of the nominations are indicated; N = 174.

TABLE 3.2 | Means, minimum, maximum, and standard deviation of the sense of humor.

Scales	*n*	*Mean*	*Min.*	*Max.*	*SD*
Sense of humor	169	5.37	3.13	7.00	0.82
- Enjoyment of humor	169	4.99	1.75	7.00	1.24
- Laughter	168	6.03	3.25	7.00	0.93
- Verbal humor	170	5.14	2.00	7.00	1.15
- Finding humor in everyday life	169	5.27	2.50	7.00	1.03
- Laughing at yourself	170	5.63	3.00	7.00	1.05
- Humor under stress	173	5.17	1.75	7.00	1.35

Note. Sense of humor was measured on a 7-point rating scale from 1 to 7.

Hypotheses 1, 2, 3, and 5

The COVID-19 pandemic affected nurses' stress levels. They experienced more stress ($t_{(173)}$ = 3.14, p = .002, d_z = 0.24), had higher values on emotional irritation ($t_{(171)}$ = 4.63, p < .001, d_z = 0.35), and felt more emotionally exhausted ($t_{(172)}$ = 8.08, p < .001, d_z = 0.61) during the COVID-19 pandemic than during the time before COVID-19. These results support Hypothesis 1. The nurses also felt less flow during the COVID-19 pandemic than before ($t_{(173)}$ = -7.67, p < .001, d_z = -0.58), thereby confirming Hypothesis 2. This pattern was found for all subscales: absorption ($t_{(169)}$ = -6.66, p < .001, d_z = -0.51), perceived demand-skill balance ($t_{(173)}$ = -5.38, p < .001, d_z = -0.41), and enjoyment ($t_{(172)}$ = -8.44, p < .001, d_z = -0.64). Similarly, satisfaction with work ($t_{(170)}$ = -5.91, p < .001, d_z = -0.45), life ($t_{(169)}$ = -5.91, p < .001, d_z = -0.45), work performance ($t_{(163)}$ = -6.69, p < .001, d_z = -0.52), and well-being ($t_{(166)}$ = -6.03, p < .001, d_z = -0.47) also decreased during the COVID-19 pandemic, thereby confirming Hypothesis 3. Regarding appreciation from patients and society, we identified a pattern that was not entirely in line with our Hypothesis 5. While the nurses reported feeling more appreciation from society ($t_{(166)}$ = 3.54, p = .001, d_z = 0.27) during the COVID-19 pandemic (confirming Hypothesis 5), they felt *less* appreciation from their patients ($t_{(173)}$ = -2.72, p = .007, d_z = -0.21) during that time. All results concerning means, standard deviations, significance tests, and effect sizes are summarized in **Table 3.3**.

Buffering Effects of Sense of Humor

In Hypothesis 4 we postulated that sense of humor has a buffering effect on the different outcome variables during the COVID-19 pandemic. Participants scoring higher on the sense of humor scale were assumed to be less influenced by the COVID-19 pandemic than subjects with

lower sense of humor values. We calculated the difference scores of all outcomes (M_{during} - M_{before}) and performed a linear regression for the full scale and each subscale of the sense of humor scale.

Sense of humor (R^2 = .04, β = -.20, $F_{(1, 160)}$ = 6.56, p = .011) and the subscales enjoyment of humor (R^2 = .03, β = -.18, $F_{(1, 160)}$ = 5.51, p = .020), finding humor in everyday life (R^2 = .05, β = -.21, $F_{(1, 161)}$ = 7.58, p = .007), and humor under stress (R^2 = .06, β = -.25, $F_{(1, 164)}$ = 11.06, p = .001) buffered the effects of the COVID-19 pandemic on emotional exhaustion as expressed in significant effects on the difference scores. Nurses scoring higher on the humor facets had less increase in emotional exhaustion due to the COVID-19 pandemic. The same pattern was found for the effect of enjoyment of humor on emotional irritation (R^2 = .04, β = -.20, $F_{(1, 161)}$ = 6.60, p = .011). Also as predicted, sense of humor (R^2 = .03, β = .16, $F_{(1, 163)}$ = 4.19, p = .042), enjoyment of humor (R^2 = .05, β = .23, $F_{(1, 163)}$ = 8.90, p = .003), finding humor in everyday life (R^2 = .03, β = .16, $F_{(1, 164)}$ = 4.17, p = .043), and humor under stress (R^2 = .07, β = .26, $F_{(1, 167)}$ = 12.35, p = .001) had significant effects on the difference scores of flow. Participants scoring higher on these subscales showed a smaller decrease of flow experience due to the COVID-19 pandemic than did subjects scoring lower on these sense of humor subscales. The subscale enjoyment of humor had a buffering effect on satisfaction with work (R^2 = .05, β = .22, $F_{(1, 161)}$ = 8.03, p = .005) and humor under stress had a significant effect on satisfaction with work (R^2 = .06, β = .25, $F_{(1, 165)}$ = 10.57, p = .001) and on satisfaction with work performance (R^2 = .04, β = .20, $F_{(1, 161)}$ = 6.37, p = .013).

Buffering Effect of Appreciation

In Hypothesis 6 we postulated that experienced change in appreciation due to the pandemic would have a buffering effect on stress, emotional irritation, emotional exhaustion, frequency of flow experience, and satisfaction. With the difference scores for appreciation as independent variables and the difference scores of the outcome variables we performed linear regressions. Appreciation from patients had a buffering effect on emotional exhaustion (R^2 = .06, β = -.25, $F_{(1, 162)}$ = 10.44, p = .001), frequency of flow experience (R^2 = .09, β = .31, $F_{(1, 165)}$ = 16.94, p < .001), satisfaction with work (R^2 = .05, β = .22, $F_{(1, 164)}$ = 8.63, p = .004), and satisfaction with work performance (R^2 = .06, β = .23, $F_{(1, 159)}$ = 9.25, p = .003). Appreciation from society only influenced frequency of flow experience (R^2 = .04, β = .19, $F_{(1, 159)}$ = 5.83, p = .017). Stress (single item), satisfaction with life and well-being were not influenced by appreciation or sense

of humor. Thus, we can only partially confirm Hypotheses 4 and 6. For an overview see **Table 3.4**.

TABLE 3.3 | Means, standard deviations, significance test, and effect sizes before and during the COVID-19 pandemic.

			Before the pandemic		**During the pandemic**				
Scales	Scale Range	*n*	*Mean*	*SD*	*Mean*	*SD*	*t*	*p* $_{two\text{-}tailed}$	Cohen's d_z
Stress (single item)	1 - 5	174	3.16	0.98	3.46	1.09	3.14	**.002**	0.24
- Emotional Irritation	1 - 7	172	2.55	1.39	3.12	1.65	4.63	**< .001**	0.35
- Emotional exhaustion	1 - 7	173	3.12	1.36	3.97	1.59	8.08	**< .001**	0.61
Flow	1 - 6	174	4.18	1.00	3.58	1.11	-7.67	**< .001**	-0.58
- Absorption	1 - 6	170	4.54	0.90	4.05	1.09	-6.66	**< .001**	-0.51
- Challenge-skill-balance	1 - 6	174	3.90	1.20	3.41	1.26	-5.38	**< .001**	-0.41
- Enjoyment	1 - 6	173	4.15	1.08	3.42	1.24	-8.44	**< .001**	-0.64
Satisfaction									
- Work	1 - 7	171	4.79	1.12	4.14	1.51	-5.91	**< .001**	-0.45
- Life	1 - 7	170	5.09	1.27	4.32	1.50	-5.91	**< .001**	-0.45
- Work performance	1 - 7	164	5.58	1.06	4.88	1.37	-6.69	**< .001**	-0.52
- Well-being	1 - 7	167	4.74	1.29	3.97	1.48	-6.03	**< .001**	-0.47
Appreciation									
- Patients	1 - 5	174	3.60	1.08	3.39	1.23	-2.72	**.007**	-0.21
- Society	1 - 5	167	2.01	0.99	2.37	1.23	3.54	**.001**	0.27

Note. Significant results (two-tailed; p < .050) are shown in bold.

Hypotheses 4 and 6

TABLE 3.4 | Buffering effects of sense of humor and appreciation using difference scores.

	Stress		*Emotional Irritation*		*Emotional Exhaustion*		*Frequency of flow experience*		*Satisfaction – Work*		*Satisfaction – Life*		*Satisfaction – Work performance*		*Satisfaction – Well-being*	
	R^2	β	R^2	β	R^2	β	R^2	β	R^2	β	R^2	β	R^2	β	R^2	β
Appreciation																
- Patients	.01	-.11	.01	-.09	**.06**	**-.25****	**.09**	**.31****	**.05**	**.22****	.00	-.05	**.06**	**.23****	.00	.02
- Society	.00	-.04	.00	-.03	.00	-.03	**.04**	**.19***	.00	.06	.02	-.14	.00	.01	.00	.06
Sense of humor	.01	-.11	.00	-.02	**.04**	**-.20***	**.03**	**.16***	.02	.13	.00	-.01	.00	.01	.00	-.03
- Enjoyment of humor	.01	-.08	**.04**	**-.20***	**.03**	**-.18***	**.05**	**.23****	**.05**	**.22****	.01	.07	.01	.12	.01	.10
- Laughter	.01	-.09	.01	.10	.00	-.06	.00	.03	.00	.04	.01	-.11	.00	-.01	.01	-.11
- Verbal humor	.01	-.08	.00	.01	.02	-.13	.02	.12	.02	.13	.01	.11	.00	.01	.00	.01
- Finding humor in everyday life	.00	-.03	.01	.12	**.05**	**-.21****	**.03**	**.16***	.01	.08	.00	-.03	.00	.05	.00	-.02
- Laughing at yourself	.02	-.14	.01	.08	.00	-.07	.00	.02	.00	.01	.02	-.12	.01	-.11	.01	-.12
- Humor under stress	.02	-.13	.00	-.06	**.06**	**-.25****	**.07**	**.26****	**.06**	**.25****	.01	.11	**.04**	**.20***	.01	.07

*Note. Significant results are shown in bold; ** p < .010; * p < .050. n varies due to the pairwise deletion of data between 152 and 169 (see **supplementary material Table S3.5**).*

Discussion

The aim of this study was to investigate effects of the COVID-19 pandemic on nurses' subjectively perceived psychological states. We investigated *changes* in stress, frequency of flow experience, and satisfaction with work, life, work performance, and well-being during the COVID-19 pandemic compared to before the COVID-19 pandemic. We next examined the buffering effects of sense of humor and perceived appreciation on these psychological states. We could show that nurses felt more stressed, had flow experiences less frequently, and lower values of satisfaction with work, life, work performance and well-being during the COVID-19 pandemic compared to before the COVID-19 pandemic. They felt more appreciation from society but less from their patients. In line with our assumptions, we found both sense of humor and perceived appreciation to have buffering effects. More specifically, sense of humor buffered the negative effects of the COVID-19 pandemic for emotional exhaustion and frequency of flow experience. When looking more closely at its subscales, humor under stress buffers against the negative effects of the COVID-19 pandemic for emotional exhaustion, frequency of flow experience, satisfaction with work, and satisfaction with work performance. Further, enjoyment of humor buffered the negative effects of the COVID-19 pandemic on emotional irritation, emotional exhaustion, frequency of flow experience, and satisfaction with work. Only the subscales laughter, verbal humor, and laughing at yourself of the sense of humor scale showed no buffering effects on any negative effects of the COVID-19 pandemic.

For perceived appreciation, we observed that perceived appreciation from patients had a buffering effect on emotional exhaustion, frequency of flow experience, satisfaction with work, and satisfaction with work performance. For perceived appreciation from society, only a buffering effect on frequency of flow experience was found.

In the following we discuss these results in light of further findings of our study and findings in the literature.

The heightened stress levels found in our study are in line with our further result that the COVID-19 pandemic had a massive influence on the workloads of the nurses in our sample. About 66% of the nurses stated that they had more or significantly more to do than before. Only 16% said that they had significantly less or less to do. These results show that the COVID-19 pandemic changed the working lives of nurses in Germany and underlines the importance of studies addressing the effects of the COVID-19 pandemic on employees, especially because workload is an important factor affecting nurses' stress levels (McGrath et al., 2003). In line

with this, increased workload during the COVID-19 pandemic could be one reason for the nurses' increased stress. The increased stress levels in our study are also in line with results of a Chinese sample investigated in February and March 2020. In that study, a total of 97.9% of participants showed at least one posttraumatic stress symptom and about 40% were within the clinically relevant range (mild/positive). These rates are much higher than in the sample of university students who participated in the same study (94% and 34%). A total of 8.6% of the sample showed mild to extremely severe values of stress (Si et al., 2020). Further factors exacerbating the effects of the COVID-19 pandemic on the stress levels were, for example, confirmed COVID-19 cases within one's living community, or among friends and relatives. Accordingly, this fear of infecting others was likely another reason for increased stress, and in particular for the increased emotional irritation found in our sample. This was supported by our descriptive results: With a mean of 4.17 (scale from 1 - 6), participants in our sample were concerned with the health of their family and friends. This result is even more alarming given that our study was conducted in June 2020, a time when the number of infections was relatively low in most parts of Germany. Similarly, the chances of getting a fatal disease were classified as a negative life event with a high negative valence (Cohen et al., 2018). Thus fear of contracting the disease oneself could be yet another factor with effects on stress. However, when looking at our descriptive results, fear of getting health issues oneself is rated lower (Mean = 3.17; scale from 1 - 6) than concern about the health of others. During the *Severe Acute Respiratory Syndrome (SARS)* breakout in 2003 nurses were emotionally affected (Chan & Chan, 2004). This concurs with our findings here, that emotional irritation and emotional exhaustion increased due to the COVID-19 pandemic. At the same time, variables with a positive emotional tone decreased, i.e., frequency of flow experience, satisfaction with life, satisfaction with work, satisfaction with work performance, and satisfaction with well-being.

In terms of perceived appreciation, we identified an interesting pattern. While perceived appreciation from society increased, perceived appreciation from patients decreased. One reason may be the extraordinary situation in hospitals. Patients may have been frustrated due to the ban on visitors. Possibly they were in a bad mood and transferred these feelings to their nurses. By contrast, the nurses' work came under the focus of society during the COVID-19 pandemic. People showed their respect by giving public applause, and politicians discussed giving a financial bonus. These factors may have influenced perceived appreciation from patients versus that from society. Gratitude for the support of society was already mentioned in a Chinese sample (Sun et al., 2020) and supports our result for the German sample in this study.

Frequency of flow experience decreased during the COVID-19 pandemic. As outlined in the introduction, we attribute this finding to the increased stress of nurses due to the COVID-19 pandemic (Islam et al., 2020; Muller et al., 2020; Si et al., 2020; Spoorthy, 2020; Temsah et al., 2020). This finding is in line with those of studies on the relationship between stress-related physiological indicators and flow experience: while moderate levels of stress are positively related to flow, high levels of stress were found to decrease flow (Peifer et al., 2014, 2015). Another reason for the decreased flow experience could be that nurses had to change their working routines and had to learn new procedures, which meant that they could no longer use their existing expertise. In the context of flow it has been shown that experts experience more flow during an activity than do novices (Rheinberg & Engeser, 2018). As the nurses had to learn new routines, their expert status possibly changed to novice status in some of their tasks.

Besides the negative main effect of the COVID-19 pandemic on the frequency of flow and the increasing effects on stress, we observed a buffering effect of sense of humor. This underlines the assumption that humor is a successful coping strategy (Martin, 2003), which should be fostered in difficult times. One reason for these buffering effects could be that humor in the workplace fosters cohesiveness among nurses (Beck, 1997). In a study on the staff of a children's blood and cancer center it was found that the feeling of belonging to a "work family" enhances resilience (Aburn et al., 2021).

Our results showed different patterns for the subscales of the sense of humor scale. We therefore suggest investigating both: all subscales and the whole scale as recommended by the authors (Ruch & Heintz, 2018). In addition to the buffering effects of a sense of humor, we also observed buffering effects of perceived appreciation by society and patients on frequency of flow experience.

Strengths and Limitations

Because we used an online questionnaire for our study, we were able to contact a large number of nurses and they were able to independently schedule their participation in this study. Another strength is that our study was conducted in the middle of the first lockdown in Germany, when the pandemic situation was ongoing among our target group. Also, by including many different psychological experiences (e.g., stress, flow experience, satisfaction, and appreciation) in our study and focusing on positive coping strategies, we were able to contribute to the development of ideas to better understand and help nurses in this challenging situation.

There are also some limitations that should be mentioned. First, this study was not longitudinal. The COVID-19 pandemic was unpredictable, so we used a cross-sectional approach. In order to still be able to assess the changes due to the COVID-19 pandemic, we used a retrospective approach and asked the nurses to relate their answers to the time before the COVID-19 pandemic started. We had good reason to hope that in June the time before the COVID-19 pandemic was still well remembered. However, we obviously cannot exclude the possibility of some recall bias. Because of the cross-sectional data, the assumption of causality cannot be statistically demonstrated. The other causal direction of the presented effects is also possible. While 299 participants started to fill out our online questionnaire, only 174 proceeded to the end of the survey. This high dropout rate may be another sign of the high strain these nurses were under.

Implications and Future Research

More than half of Chinese nurses actively searched for psychological resources such as self-help coping methods and even psychotherapy during the COVID-19 pandemic (Kang et al., 2020). This underlines the clear need for interventions that address nurses. Our results provide clear implications for such interventions.

The buffering effect of sense of humor (and its subscales) on stress, the frequency of flow and satisfaction underlines the high potential of using humor for stress management in the health care sector. Also, the use of humor was found to be appreciated by patients as a positive characteristic of nurses and is particularly important for nurse-patient interaction (Tanay et al., 2014). Hence, humor is additionally a potential approach to increase appreciation experienced from patients, and both are potential protective factors in everyday work. A promising approach is thus to cultivate a sense of humor in interventions for nurses through a targeted humor training (Sousa et al., 2019). An existing intervention is the “7 Humor Habits Program” by McGhee (2010a) that aims to build and strengthen humor in everyday life. Evidence for the effectiveness of this humor intervention in increasing humor has been reported in various studies (Crawford & Caltabiano, 2011; Hofmann & Giuliani, 2019; Ruch et al., 2018).

It would moreover be possible to offer interventions that directly address the reduction of stress experience and the increase of flow experience. The literature suggests that stress can be transformed into flow experience (Donner & Csikszentmihalyi, 1992) and further that flow can be used as a coping strategy (Csikszentmihalyi, 1990; Peifer, 2012) and as a sustainer of coping

(Lazarus et al., 1980). Thus, specific training for nurses to increase flow in the work context would be beneficial for actively using flow as a coping strategy. Promoting flow in nurses is a promising approach to reducing negative stress.

In our study we were able to show the buffering effects of appreciation on stress, frequency of flow experience, and satisfaction. Therefore, it is important to increase appreciation for nurses from patients and from society. An approach to increasing patients' appreciation and understanding is transparent information about the current situation so that they can better accept restrictions and not blame the nurses for it. Such information could be given in direct communication or information materials (e.g., flyers, information placards) provided by the hospital. Also, communication training may help nurses to communicate this information objectively but empathetically to patients. To further increase appreciation from society there should be information and awareness campaigns that underline the importance and the demands that are part of care workers' profession so that people comprehend the important value of nurses.

Conclusion

COVID-19 has rapidly changed the working conditions of nurses in Germany. This leads to an increase in stress level and a decrease in flow experiences, satisfaction, and appreciation from patients. Appreciation from society increased. Coping strategies are important to handle the COVID-19 pandemic among nurses. Sense of humor and appreciation are two resources that help nurses deal with the COVID-19 pandemic. Training in humor, training in communication, stress and flow experience offer a promising approach to dealing with the current challenges. More research on the working conditions of nurses and the effects of the COVID-19 pandemic on them is still needed.

References - Chapter 3

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Supplementary Material Chapter 3

Chapter 3: Negative Effects of the COVID-19 Pandemic on Nurses can be Buffered by a Sense of Humor and Appreciation

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TABLE S3.1 | Self-constructed scales and items.

German items used in the study	**English items**	**Scale**
Stress – single item (self-constructed)		
Wie sehr fühlten Sie sich gestresst?	How stressed did you feel?	1 = *not at all* to 5 = *very strong* 1 = *überhaupt nicht* bis 5 = *sehr stark*
Flow Frequency Scale (Bartzik and Peifer, in preparation)		
Before the COVID-19 Pandemic Please imagine yourself in your daily work experience before the Corona Crisis, in early February 2020. Below are a series of questions about your daily experience at work. Please indicate how often or rarely you had each experience.	**During the COVID-19 Pandemic** Please put yourself in your daily work experience during the Corona restrictions and answer the following questions: Please indicate how often or rarely you had each experience.	
How often did you experience at work that...	How often did you experience in your daily work during the Corona restrictions that...	
1. … Sie vollständig auf Ihr Tun konzentriert waren.	1. … you were completely focused on what you were doing.	1 = *Never*, 2 = *Almost never*, 3 = *Sometimes*, 4 = *Often*, 5 = *Very Often*, 6 = *(Almost) always* 1 = *Nie,* 2 = Fast nie, 3 = Manchmal, 4 = Häufig, 5 = Sehr häufig, 6 = *(Fast) immer*
2. … Sie überrascht waren, wie schnell die Zeit verging.	2. … you were surprised how quickly time passed.	
3. … Sie im Tun Freude empfanden.	3. … you felt joy in what you were doing.	
4. … Sie ganz in einer Tätigkeit aufgingen.	4. … you were completely absorbed in an activity.	
5. … Sie genau im richtigen Maß gefordert wurden.	5. … you were challenged in just the right degree.	
6. … Sie die Arbeit genießen konnten.	6. … you could enjoy the work.	
7. … Sie Ihre Fähigkeiten optimal einsetzen konnten.	7. … you could use your skills to the optimal extent.	
8. … die Anforderungen wie für Sie gemacht waren.	8. … the requirements were as made for you.	
9. … sich die Arbeit gut anfühlte.	9. … the work felt good.	
10. … Sie im Tun glücklich waren.	10. … you were happy in your doing.	

Subscales - Flow Frequency Scale: *Absorption*: Item 1, Item 2, Item 4 *Perceived demand-skill balance*: Item 5, Item 7, Item 8 *Enjoyment*: Item 3, Item 6, Item 9, Item 10		
Satisfaction (self-constructed)		
Alles in allem, wie zufrieden waren Sie mit Ihrer Arbeit?	All in all, how satisfied were you with your work?	1 = *extremely dissatisfied* to 7 = *extremely satisfied.* 1 = *sehr unzufrieden* bis 7 = *sehr zufrieden*
Alles in allem, wie zufrieden waren Sie mit Ihrem Leben?	All in all, how satisfied were you with your life?	
Alles in allem, wie zufrieden waren Sie mit Ihrer beruflichen Leistung?	All in all, how satisfied were you with your work performance?	
Alles in allem, wie zufrieden waren Sie mit Ihrem Wohlbefinden?	All in all, how satisfied were you with your well-being?	
Appreciation (self-constructed)		
Wie sehr fühlten Sie sich von Ihren Patienten wertgeschätzt?	How much did you feel appreciated by the patients?	1 = *not at all* to 5 = *very much.* 1 = *überhaupt nicht* bis 5 = *sehr stark*
Wie sehr fühlten Sie sich von der Gesellschaft wertgeschätzt?	How much did you feel appreciated by the society?	1 = *not at all* to 5 = *very much.* 1 = *überhaupt nicht* bis 5 = *sehr stark*
COVID-19 pandemic items (self-constructed)		
Ich machte mir aufgrund von Corona große Sorgen um meine eigene Gesundheit.	I was very concerned about my own health because of Corona.	1 = *do not agree at all* to 6 = *totally agree* 1 = *trifft überhaupt nicht zu* bis 6 = *trifft vollständig zu*
Ich machte mir aufgrund von Corona große Sorgen um die Gesundheit von Angehörigen und / oder Freunden.	I was very concerned about the health of family and friends because of Corona.	

Ich machte mir wegen Corona Sorgen um meine wirtschaftliche Zukunft.	I was very concerned about my economic future because of Corona.	
Workload during COVID-19 pandemic (self-constructed)		
Durch Corona hatte ich auf der Arbeit gerade…	Because of the COVID-19 pandemic I had to work…	1= *significantly less*, 2 = *less*, 3 = just the same, 4 = *more* or 5 = *significantly more*. 1= *deutlich weniger zu tun*, 2 = *weniger zu tun*, 3 = *gleich viel zu tun*, 4 = *mehr zu tun* oder 5 = *deutlich mehr zu tun*.

TABLE S3.2 | Pearson correlations between sense of humor and psychological states before and during the COVID-19 pandemic.

Scales	Sense of humor	Enjoyment of humor	Laughter	Verbal humor	Finding humor in everyday life	Laughing at yourself	Humor under stress
	Before the COVID-19 pandemic						
Stress (single item)	.04	.04	.06	.01	.04	-.00	.02
- Emotional irritation	**-.22****	.00	**-.23****	**-.16***	**-.21****	**-.28****	**-.23****
- Emotional exhaustion	-.05	.06	**-.18***	.03	-.07	**-.18***	-.10
Flow	**.25****	.01	**.32****	.15	**.27****	**.27****	**.26****
- Absorption	**.20****	.05	**.27****	.08	**.23****	**.16***	**.21****
- Challenge-skill-balance	**.22****	-.00	**.29****	.10	**.24****	**.26****	**.21****
- Enjoyment	**.24****	-.01	**.30****	**.18***	**.25****	**.26****	**.23****
Satisfaction							
- Work	**.18***	.01	**.16***	.13	**.27****	**.15***	**.15***
- Life	**.22****	.02	**.18***	**.15***	**.20***	**.23****	**.21****
- Work performance	**.23****	.05	**.22****	**.28****	**.22****	**.34****	**.17***
- Well-being	**.26****	.01	**.22****	**.23****	**.23****	**.27****	**.22****
Appreciation							
- Patients	.08	-.04	.15	.07	.15	.10	**.17***
- Society	**.17***	.13	.15	.10	.07	.06	.13
	During the COVID-19 pandemic						
Stress (single item)	-.08	-.03	-.03	-.08	.01	-.14	-.13
- Emotional irritation	**-.17***	-.13	-.07	-.11	-.05	**-.17***	**-.25****
- Emotional exhaustion	**-.19***	-.12	**-.20***	-.10	**-.16***	**-.15***	**-.27****
Flow	**.35****	**.22****	**.33****	**.22****	**.34****	**.22****	**.43****
- Absorption	**.29****	**.22****	**.27****	**.23****	**.31****	**.16***	**.40****
- Challenge-skill-balance	**.30****	**.18***	**.31****	.14	**.26****	**.20****	**.33****
- Enjoyment	**.36****	**.21****	**.29****	**.25****	**.34****	**.23****	**.43****
Satisfaction							
- Work	**.26****	**.24****	**.16***	**.21****	**.22****	.09	**.34****
- Life	.15	.06	-.02	**.23****	.10	.09	**.22****
- Work performance	**.17***	.14	.14	**.21****	**.18***	**.16***	**.31****
- Well-being	**.18***	.11	.03	**.20****	**.19***	.11	**.27****
Appreciation							
- Patients	**.19***	.14	**.24****	**.19***	**.22****	.11	**.26****
- Society	.14	.12	**.16***	.13	.11	.07	**.19***

*Note. Significant results (two-tailed) are shown in bold; ** p < .010 (two-tailed); * p < .050 (two-tailed). n varies due to the pairwise deletion of data between 161 and 173.*

TABLE S3.3 | Intercorrelations before the COVID-19 pandemic.

Scales	1	2	3	4	5	6	7	8	9	10	11	12	13
Stress (single item) (1)	1												
- Emotional irritation (2)	**.30****	1											
- Emotional exhaustion (3)	**.47****	**.52****	1										
Flow (4)	**-.28****	**-.46****	**-.58****	1									
- Absorption (5)	**-.15***	**-.36****	**-.38****	**.87****	1								
- Challenge-skill-balance (6)	**-.24****	**-.39****	**-.52****	**.92****	**.69****	1							
- Enjoyment (7)	**-.33****	**-.48****	**-.62****	**.95****	**.74****	**.82****	1						
Satisfaction													
- Work (8)	**-.41****	**-.27****	**-.52****	**.57****	**.40****	**.52****	**.60****	1					
- Life (9)	**-.19***	**-.33****	**-.33****	**.36****	**.27****	**.34****	**.35****	**.37****	1				
- Work performance (10)	**-.19***	**-.24****	**-.38****	**.36****	**.23****	**.35****	**.38****	**.50****	**.32****	1			
- Well-being (11)	**-.23****	**-.36****	**-.35****	**.47****	**.38****	**.43****	**.46****	**.39****	**.55****	**.28****	1		
Appreciation													
- Patients (12)	**-.27****	**-.28****	**-.30****	**.47****	**.34****	**.44****	**.44****	**.40****	**.15***	**.25****	.14	1	
- Society (13)	**-.17***	**-.20***	**-.21****	**.30****	**.18***	**.30****	**.30****	.14	.15	.06	**.19***	**.25****	1

*Note. Significant results (two-tailed) are shown in bold; ** p < .010 (two-tailed); * p < .050 (two-tailed). n varies due to the pairwise deletion of data between 161 and 174.*

TABLE S3.4 | Intercorrelations during the COVID-19 pandemic.

Scales	1	2	3	4	5	6	7	8	9	10	11	12	13
Stress (single item) (1)	1												
- Emotional irritation (2)	**.55****	1											
- Emotional exhaustion (3)	**.58****	**.59****	1										
Flow (4)	**-.33****	**-.43****	**-.62****	1									
- Absorption (5)	**-.20***	**-.37****	**-.44****	**.87****	1								
- Challenge-skill-balance (6)	**-.23****	**-.33****	**-.50****	**.89****	**.68****	1							
- Enjoyment (7)	**-.39****	**-.46****	**-.67****	**.93****	**.72****	**.74****	1						
Satisfaction													
- Work (8)	**-.38****	**-.45****	**-.54****	**.68****	**.51****	**.59****	**.67****	1					
- Life (9)	**-.34****	**-.35****	**-.33****	**.39****	**.30****	**.32****	**.40****	**.48****	1				
- Work performance (10)	**-.19***	**-.37****	**-.39****	**.58****	**.45****	**.53****	**.56****	**.65****	**.30****	1			
- Well-being (11)	**-.45****	**-.39****	**-.49****	**.48****	**.36****	**.40****	**.48****	**.57****	**.59****	**.42****	1		
Appreciation													
- Patients (12)	**-.19***	**-21****	**-.27****	**.52****	**.48****	**.46****	**.46****	**.41****	**.18***	**.35****	**.28****	1	
- Society (13)	-.06	-.13	**-.26****	**.36****	**.31****	**.26****	**.37****	**.31****	.08	**.26****	**.31****	**.41****	1

*Note. Significant results (two-tailed) are shown in bold; ** p < .010 (two-tailed); * p < .050 (two-tailed). n varies due to the pairwise deletion of data between 166 and 174.*

TABLE S3.5 | Buffering effects of sense of humor and appreciation using difference scores including sample sizes.

	Stress			*Emotional Irritation*			*Emotional Exhaustion*			*Frequency of flow experience*			*Satisfaction – Work*			*Satisfaction – Life*			*Satisfaction – Work performance*			*Satisfaction – Well-being*		
	n	R^2	β	*n*	R^2	β	*n*	R^2	β	*n*	R^2	β	*n*	R^2	β	*n*	R^2	β	*n*	R^2	β	*n*	R^2	β
Appreciation																								
- Patients	167	.01	-.11	166	.01	-.09	164	**.06**	**-.25****	167	**.09**	**.31****	166	**.05**	**.22****	162	.00	-.05	161	**.06**	**.23****	161	.00	.02
- Society	159	.00	-.04	157	.00	-.03	158	.00	-.03	161	**.04**	**.19***	158	.00	.06	154	.02	-.14	153	.00	.01	152	.00	.06
Sense of humor	164	.01	-.11	163	.00	-.02	162	**.04**	**-.20***	165	**.03**	**.16***	163	.02	.13	159	.00	-.01	158	.00	.01	156	.00	-.03
- Enjoyment of humor	164	.01	-.08	163	**.04**	**-.20***	162	**.03**	**-.18***	165	**.05**	**.23****	163	**.05**	**.22****	159	.01	.07	158	.01	.12	157	.01	.10
- Laughter	163	.01	-.09	162	.01	.10	161	.00	-.06	164	.00	.03	162	.00	.04	158	.01	-.11	157	.00	-.01	155	.01	-.11
- Verbal humor	165	.01	-.08	164	.00	.01	163	.02	-.13	166	.02	.12	164	.02	.13	160	.01	.11	160	.00	.01	157	.00	.01
- Finding humor in everyday life	164	.00	-.03	163	.01	.12	163	**.05**	**-.21****	166	**.03**	**.16***	164	.01	.08	159	.00	-.03	159	.00	.05	156	.00	-.02
- Laughing at yourself	165	.02	-.14	164	.01	.08	163	.00	-.07	166	.00	.02	164	.00	.01	160	.02	-.12	159	.01	-.11	158	.01	-.12
- Humor under stress	168	.02	-.13	167	.00	-.06	166	**.06**	**-.25****	169	**.07**	**.26****	167	**.06**	**.25****	163	.01	.11	163	**.04**	**.20***	160	.01	.07

*Note. Significant results are shown in bold; ** p < .010; * p < .050.*

Chapter 4: Care for Joy: Evaluation of a Humor Intervention and Its Effects on Stress, Flow Experience, Work Enjoyment, and Meaningfulness of Work

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Ethics approval and consent for participants

This study involved human participants and was reviewed and approved by the local ethics committee at the Faculty of Psychology, Ruhr University Bochum, Germany. Written informed consent to participate in this study was provided by the participants.

Author contribution statements

MBa, CP, AB, SH, AD-D, and PA carried out the study. MBa and CP developed the theory, wrote the methods and discussion. MBa performed the computations and wrote the results. CP supervised the concept and findings of this work. All authors conceived of the presented idea, discussed the results, and contributed to the final manuscript.

Conflict of interest statement

The authors Gerrit Krause, Peter Ahaus, and Angelika Dahl-Dichmann were employed by the company "Alexianer GmbH". The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Chapter 4 – Information

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Minor formatting changes were made in this chapter, for example, to tables, presentation of statistics (e.g., the standard deviations were changed), or figures, in order to achieve a consistent formatting style throughout this thesis.

Abstract

The media increasingly speak of a care crisis. Systematic support is needed to prepare nursing apprentices for the high demands of their profession and to reduce the number of nurses who finally quit. Particularly in stressful jobs like nursing, humor as a coping strategy can have a beneficial effect on perceived stress and overall work enjoyment. In this study, we used a humor intervention among nursing staff in training and evaluated its effects on humor, stress, work enjoyment, the meaningfulness of work, and flow experience. The sample consists of 104 nurses in training. The intervention group received a 3-h humor intervention, while the control group received no intervention. Positive and negative affect were measured immediately before and after the intervention. Humor was measured before the intervention (t_0) and again 6 months later (t_1); at t_1, we again measured humor and also stress, work meaningfulness, work enjoyment, and flow experience. Our analyses showed a beneficial change in positive and negative affect right after the intervention. By means of repeated measures ANOVA we could further confirm an effect of the intervention on reported humor 6 months later. Humor mediated positive effects of the humor intervention on perceived meaningfulness of work, work enjoyment, and on the frequency of flow at work. Also, we found a significant negative relationship between humor and stress measured at t_1. The results of this study confirm the effectiveness of humor interventions in promoting humor, and, through this, the meaningfulness of work, work enjoyment, and the frequency of flow experience. Implications of the use of humor interventions in the nursing profession are discussed.

Keywords: Humor - Intervention - Stress - Flow experience - Work enjoyment - Meaningfulness of work - Nurse

Introduction

Media often speak of a care crisis. Due to demographic change and medical progress, a considerable shortage of skilled workers in the nursing profession is predicted for the future (Bundesagentur für Arbeit, 2017, 2018, 2020). Reasons for this are the increasing age of the patients and the increasing age of the nurses themselves; also, it is expected that fewer young nurses will enter the profession in the future (Hornung, 2013). We further know that nursing staff are under great physical and psychological strain in their profession, and there has been an increase in absenteeism and the intention to terminate (Hasselhorn & Müller, 2005). Accordingly, there is a need for action regarding the working conditions of nursing staff to make the profession more attractive for young nurses and to reduce fluctuations. In particular, the increased number of terminations by nurses can have extensive consequences, such as high economic costs, reduced well-being of the remaining nurses or lower satisfaction with care from the patient's perspective (Hayes et al., 2012). Experienced stress at work can be a reason for termination intentions (Chiang & Chang, 2012; Choi & Kim, 2020), and also for burnout among nurses (Schmitz et al., 2000). Not only does burnout negatively impact health among nurses (Khamisa et al., 2015), but patients also show higher satisfaction with care when nurses report lower burnout levels (Vahey et al., 2004). Accordingly, there is a need for interventions that help nurses to cope with their work-related stress (Estryn-Behar et al., 1990; Roberts & Grubb, 2014). Research has identified the use of humor as a promising strategy to deal with stress (Bennett, 2003; Martin, 2004; Martin & Lefcourt, 1983; McGhee, 2010a; Putz & Breuer, 2017). The aim of our study is, thus, to evaluate the effectiveness of a humor intervention for nurses in training. More specifically, we look at the effects of the intervention on sense of humor, and, in consequence, on work experience, including perceived stress, work enjoyment, frequency of flow experience, and perceived meaningfulness of work as mediated by one's sense of humor. The humor intervention was conducted with nurses in training and their results were compared to a control group without intervention.

Humor

The construct of humor has been described in the field of Positive Psychology (Ruch et al., 2010) and is a very complex, multidimensional phenomenon. There are various approaches to its definition and classification (Scheel, 2017). One such approach was that of Martin (2006), according to whom humor is a process with cognitive, emotional and interpersonal aspects (Martin, 2006); it can be defined as

> "... a broad term that refers to anything that people say or do that is perceived as funny and tends to make others laugh, as well as the mental processes that go into both creating and perceiving such an amusing stimulus, and also the affective response involved in the enjoyment of it. From a psychological perspective, the humor process can be divided into four essential components: (1) a social context, (2) a cognitive-perceptual process, (3) an emotional response, and (4) the vocal-behavioral expression of laughter." (Martin, 2006, p. 5).

In our study we refer to the sense of humor: this refers to the habit of laughing at humor and using humor more often than the average person (Ruch, 1994, 1996, 2008). Sense of humor is defined as:

> "… a habitual behavior pattern (tendency to laugh frequently, to tell jokes and amuse others, to laugh at other people's jokes), an ability (ability to create humor, to amuse others, to "get the joke," to remember jokes), a temperamental trait (habitual cheerfulness), an aesthetic response (enjoyment of particular types of humorous material), an attitude (positive attitude toward humor and humorous people), a world view (bemused outlook on life), or a coping strategy (tendency to maintain a humorous perspective in the face of adversity)." (Martin, 2003, p. 315).

We find humor not only as an independent construct, but also in other concepts of Positive Psychology, such as character strengths (Peterson & Seligman, 2004; Ruch et al., 2010; Seligman et al., 2005). Character strengths are morally valued aspects of one's personality. Examples are creativity, wisdom, kindness, bravery, modesty and many more, including humor (Peterson & Seligman, 2004). Character strengths are described as relatively stable, but they can also be changed. The definition of sense of humor shows similarities to the definition of humor as a character strength (Peterson & Seligman, 2004), and their positive relationship was confirmed in an empirical study that found correlations between the two (L. Müller & Ruch, 2011a).

Sense of humor is divided into six different sense of humor habits, which can be described as enjoyment of humor, laughter, verbal humor, finding humor in everyday life, laughing at yourself, and humor under stress (McGhee, 2010a; McGhee, 1996). The six sense of humor habits together represent a total value of the sense of humor, but this should not only be seen as a one-factor model; rather, the six different sense of humor habits each provide unique information and should, thus, also be individually reported (Ruch & Heintz, 2018).

Humor has many functions within and between persons in the work context (Scheel, 2017). For example, humor has an important function in communication (Meyer, 2000) and it can increase

well-being (Cann & Collette, 2014; Crawford & Caltabiano, 2011; Jiang et al., 2020; Proyer et al., 2010) and positive affect (Cann & Collette, 2014; Robert & Wilbanks, 2012; Szabo, 2003). Also, humor has relationships between $r = .23$ and $r = .43$ with each element of the PERMA Model (Wagner et al., 2019). The PERMA Model (Seligman, 2011) describes five pillars of well-being, which are: "positive emotions", "engagement", "positive relationships", "meaning", and "accomplishment" (Seligman, 2011). Building upon the positive relationship between humor, positive emotions and well-being, including the five pillars of the PERMA model, research has found that humor can function as a coping strategy in dealing with stress (Martin, 2003; McGhee, 2010b; McGhee, 2016). Increased well-being is associated with greater resilience and, thus, can acts as a protective factor against stress (Z.-S. Li & Hasson, 2020). Also, the positive emotions elicited by humor in the moment are not compatible with stress, which supports a re-framing of the situation and successful coping (McGhee, 2010b).

Humor in the Care Context

Humor as a form of communication is a helpful tool for patient-centered care (Scholl, 2007). For example, humor can be used to build and maintain a relationship (Bauer & Geront, 1999). Literature suggests that humor improves the understanding of therapeutic concepts and leads to a higher acceptance and therapy adherence; this further results in reduced challenges for the care givers (Consoli et al., 2018). Use of humor by nurses is interpreted by patients as a positive characteristic of a nurse and is also an important aspect of patient/nurse interaction (Tanay et al., 2014). Humor in the nursing context improves communication and also increases trust between nurse and patient (Greenberg, 2003; Sousa et al., 2019). Humor can also create a sense of cohesion not only between patients and nurses, but also among colleagues. Further, humor helps one to deal with difficult situations and difficult patients (Beck, 1997). A literature review looked at the positive aspects of humor in healthcare and concluded that nurses should be aware of their own humor and use it to interact with patients (McCreaddie & Wiggins, 2008). In general, patients' anxiety can be reduced through the use of humor (Frankenfield, 1996; Greenberg, 2003); at the same time, patients feel supported by humorous nursing interventions with regard to their health and the healing process (Greenberg, 2003). The use of humor in the nursing profession is a complex nursing intervention that requires a lot of creative energy and also cognitive skills in the interaction between patients and nurses (Greenberg, 2003; Sousa et al., 2019). It is recommended that the use of humor as a nursing intervention should be tailored

to the individual patient (Sousa et al., 2019); also, the right timing of the use of humor is important (Tan & Schneider, 2009).

Due to the complexity of nursing interventions, special training for the use of humor in the nursing context should be conducted (Sousa et al., 2019). For this reason, the humor training program "*Care for Joy*" for nurses in training has been developed. It is designed to prepare nursing staff in training for the reported high stress of their profession. This study deals with the first module of the "*Care for Joy*" training. We aim to examine the effects of this first module on sense of humor and the corresponding six sense of humor habits (McGhee, 2010a) in an intervention group as compared to a control group.

Humor Training

To use the full potential of humor in the health care context, humor trainings are promising interventions. Importantly, sense of humor is not stable over time and is considered changeable (McGhee, 2016). Studies show that sense of humor can be trained and developed (Falkenberg et al., 2013; Hofmann & Giuliani, 2019; Ruch et al., 2018). An already known training program "*The 7 Humor Habits Program*" was developed by McGhee (2010a) and provides the basis for a further practical training for psychiatric-psychotherapeutic practice, which is also suitable for healthy individuals (Falkenberg et al., 2013). "*The 7 Humor Habits Program*" aims to build and strengthen humor in everyday life as a skill for successful stress management (McGhee, 2010a). The effectiveness of humor training like "*The 7 Humor Habits Program*" has already been confirmed in studies. For example, it has been shown that humor training increases sense of humor, self-efficacy, positive thinking, optimism, and happiness and decreases negative thinking, depression, anxiety and stress (Crawford & Caltabiano, 2011; Hofmann & Giuliani, 2019; Ruch et al., 2018; Wellenzohn et al., 2018).

Humor Training in the Care Context

While humor trainings have been successfully tested in the field, there is still a lack of profession-specific humor trainings in the care context. For example, "*The 7 Humor Habits Program*" is not designed for a specific group of participants, but for all those who have forgotten to use humor in everyday life and have lost their playful attitude in life (McGhee, 2010a). Due to the complexity of humor in the care context, caregivers should receive systematic support in the form of training (Sousa et al., 2019), which takes into account job-

specific situations, such as contact with patients in difficult circumstances. In order to develop the sense of humor for nurses in training, we have therefore created a humor training for this specific target group. The training and the individual humor interventions have been developed with a problem-based approach. Problem-based training has its origin in medical school and is characterized by the fact that learning is an active process with direct reference to problems in practice (Barrows, 1996). It has been shown that learning is facilitated by using problem-based methods (Barrows, 1996); at the same time, problem-based training shows the learners how they can apply what they have learned in practice (Merrill, 2002) – a key factor for successful transfer after training. Also a meta-analysis shows that problem-based training has positive effects on the acquisition of skills, i.e., the application of knowledge (Dochy et al., 2003). Based on this, and based on the above mentioned studies that show that the sense of humor can be trained (Crawford & Caltabiano, 2011; Hofmann & Giuliani, 2019; Ruch et al., 2018), we assume that our humor intervention increases the sense of humor and the six sense of humor habits.

Hypothesis 1: The humor intervention has a positive effect on the nurses' sense of humor and on the six sense of humor habits.

Perceived Stress

A well-known stress model is the *transactional model of stress and coping* (Lazarus & Folkman, 1984), which is based on a primary assessment of a stressor and classifies this stressor as positive, negative or irrelevant. A negatively assessed stressor is subjected to a secondary assessment, in which resources are compared with the demands of the stressor. Lack of resources can lead to stress (Lazarus & Folkman, 1984). In the *transactional model of stress and coping* (Lazarus & Folkman, 1984), humor can act as a coping strategy through cognitive appraisal and subsequent behavior (Warner, 1991). Stress-based emotions and stressful person-environment relations can be regulated by humor. This was shown in a qualitative study in which nurses in training used humor as a coping strategy to cope with stressful person-environment relations (e.g., dealing with patients who violate social norms) and to achieve positive affect as an outcome (Warner, 1991). Even in extraordinary times such as the COVID-19 pandemic, humor has been shown to be an effective coping strategy (Umucu & Lee, 2020) and this was also found for nurses (Canestrari et al., 2021; Sun et al., 2020). People with a greater sense of humor can manage stress more effectively (Martin & Lefcourt, 1983). A review article on humor in medicine concludes that humor can reduce stress in medical professionals

and patients (Bennett, 2003). Humor creates positive emotions that are incompatible with stress and that thus lead to coping (McGhee, 2010b). Especially in stressful occupations such as nursing, humor as a coping strategy can have a positive effect on the perceived stress level (Bennett, 2003; Martin, 2004; Martin & Lefcourt, 1983; McGhee, 2010a; Warner, 1991). Therefore, increases in the sense of humor due to our humor intervention should translate into reduced levels of perceived stress.

Hypothesis 2: An increased sense of humor mediates negative effects of the humor intervention on perceived stress.

Work Enjoyment During Practical Training

The training of nurses alternates between phases of theoretical and practical training. Work enjoyment during practical training can be defined as "… the degree to which individuals work because they find the work itself intrinsically interesting or pleasurable" (Johnstone & Johnston, 2005; McMillan et al., 2002; Spence & Robbins, 1992 as cited in Graves et al., 2012, p. 1656). One important reason why nurses enjoy their work is because they enjoy interacting with and caring for patients, which is at the same time one reason why they stay in the nursing profession (Wilkes et al., 2016). Studies show that humor has an impact on positive affect (Cann & Collette, 2014; Martínez-Martí & Ruch, 2014; Robert & Wilbanks, 2012; Szabo, 2003). There are a strong links between the concepts of work enjoyment, positive affect and job satisfaction (Bakker, 2008; Kafetsios & Zampetakis, 2008; Moè et al., 2010), and work enjoyment has even been used as a dimension in the assessment of job satisfaction (MOAQ; Cook et al., 1981). A meta-analysis shows that humor is associated with job satisfaction (Mesmer-Magnus et al., 2012) and further that day-related job satisfaction can predict humor production the following day (Robert & Da Motta Veiga, 2017). By implementing humor in the work context, work enjoyment should thus increase (Ghaffari et al., 2015). This relationship has not yet been shown, however, in the context of health care workers. Therefore, we aim to test if the increase of sense of humor caused by the humor intervention will lead to increased work enjoyment.

Hypothesis 3: Our humor intervention increases sense of humor, which mediates a positive effect of the humor intervention on work enjoyment.

Flow Experience

Flow is described as a pleasant and rewarding state of full absorption during the performance of activities, and it facilitated clear feedback, clear goals and a balance of demands and abilities (Csikszentmihalyi, 1975). Flow can also be assigned to the *PERMA Model* (Seligman, 2011), under the pillar of engagement (Peifer & Wolters, 2017; Seligman, 2011).

Flow promotes well-being (Asakawa, 2004, 2010; Bartzik et al., 2020; Bassi et al., 2014; Rivkin et al., 2018) and performance (Bartzik et al., 2020; Christandl et al., 2018; Engeser & Rheinberg, 2008; Peifer & Zipp, 2019). Like humor (Warner, 1991), the *transactional model of stress and coping* (Lazarus & Folkman, 1984) can also be associated with flow (Peifer, 2012). In interview studies, the constructs of fun at work and flow experience were implemented into a theoretical framework; in those studies, fun at work was described as flow-promoting (Plester et al., 2015; Plester & Hutchison, 2016). In a quantitative study, a correlation between flow and humor could also be shown (van Oortmerssen et al., 2020). In line with this, self-reported humor and the element "*engagement*" from the *PERMA Model* have been shown to correlate (Wagner et al., 2019). To the best of our knowledge, there are no other studies that have investigated the direct relationship between sense of humor and flow.

Studies show that flow is positively associated with positive affect (Collins et al., 2009; Eisenberger et al., 2005; Fullagar & Kelloway, 2009) and negatively associated with negative affect (Collins et al., 2009). Fun is described as a factor that can promote flow in everyday work (Bakker & van Woerkom, 2017; Plester & Hutchison, 2016). Also, it was found that having previous positive affect was a significant predictor of increased flow (D. Li & Browne, 2006). As humor promotes positive affect (Cann & Collette, 2014; Martínez-Martí & Ruch, 2014; Robert & Wilbanks, 2012; Szabo, 2003), promoting the sense of humor should positively affect flow experience (Bakker & van Woerkom, 2017; Collins et al., 2009; Fullagar & Kelloway, 2009; D. Li & Browne, 2006; Plester & Hutchison, 2016). Based on this assumption, we propose hypothesis 4 that sense of humor can be increased by our humor intervention and that sense of humor acts as a mediator to increase the frequency of flow experience at work.

Hypothesis 4: Sense of humor mediates a positive effect of the humor intervention on flow frequency

Perceived Meaningfulness of Work

In the *Job-Characteristics Model* (Hackman & Oldham, 1976) the perceived meaningfulness of work is defined as "The degree to which the individual experiences the job as one which is generally meaningful, valuable and worthwhile" (Hackman & Oldham, 1976, p. 256). Whether or not work is considered meaningful is the result of an individual's subjective assessment (Rosso et al., 2010). Various factors affect the perceived meaningfulness of work, which are the self, others, the work and its context, and spiritual life (Rosso et al., 2010). The term "meaning" is associated with the identity of individuals and thus also with one's own work (Geldenhuys et al., 2014). Accordingly, we understand meaningful work in the nursing profession as a subjective assessment of the general meaningfulness of the work, the importance of the work for one's own identity, and the significance of the work for others and for society as a whole.

Employees who consider their work to be meaningful feel better at work, report fewer signs of depressive moods, feel needed at work and at the same time feel part of a group (Leufstadius et al., 2009). The perceived importance of work has a positive effect on well-being (Arnold et al., 2007; Leufstadius et al., 2009; Steger et al., 2012). In a study with nurses, it was found that the nursing profession is perceived as meaningful and that this perception helps to deal with difficult challenges in the work environment. Also, nurses who evaluate their work as meaningful are less dependent on positive feedback regarding their work from patients or their relatives (Bjarnadottir, 2011).

Humor as a component of character strengths is assigned to the category of transcendence strengths, which are defined as "strengths that (…) provide meaning" (Peterson & Seligman, 2004, p. 30). According to this definition, humor should also be able to provide meaning. To the best of our knowledge, there are no studies yet that investigate the effects of humor on the perceived meaningfulness of work. Based on the assumption that humor can generate meaning, we derive the hypothesis that our humor intervention enhances the perceived meaningfulness of work as mediated by an increased sense of humor.

Hypothesis 5: Sense of humor mediates a positive effect of the humor intervention on the perceived meaningfulness of work.

Summary of our Hypotheses

In sum, we examine the long-term effects of the humor intervention on the sense of humor and its six sense of humor habits *(hypothesis 1)*, and the resulting effects on perceived stress *(hypothesis 2)*, work enjoyment *(hypothesis 3)*, the frequency of flow experience *(hypothesis 4)*, and perceived meaningfulness of work *(hypothesis 5)*.

To test these hypotheses, we conducted a humor intervention with nurses in training (intervention group) while a comparable control group received no intervention. We measured sense of humor before and 6 months after the humor intervention to test our hypothesis of whether the humor intervention has long-term effects on sense of humor and the six sense of humor habits. We also examined if the increased sense of humor (as a mediator) translates into reduced stress, and increased work enjoyment, frequency of flow experience, and perceived meaningfulness of work.

Further Evaluation of the Humor Intervention

In addition to testing the above described hypotheses, we evaluated the reactions of the participants to the humor intervention with regard to their attitudes towards the humor intervention, their subjective enjoyment during the humor intervention, the perceived usefulness for their work, and the perceived difficulty of the humor intervention. We also investigated the immediate effects of the humor intervention on our participants' positive and negative affect directly before compared to directly after the intervention. Furthermore, we examined if the acute change in positive affect and negative affect due to the humor intervention was related to the sense of humor and its subscales as well as on perceived stress, work enjoyment, frequency of flow experience, and perceived meaningfulness of work at t_1.

Methods

Participants and Design

The participants were nurses in training who received a 3-h humor intervention (intervention group (IG)) or no intervention (control group (CG)). In contrast to the IG, the CG did not receive any intervention. Data collection took place at two different nursing schools of the same health care provider, so that for both groups, the schools' curriculum is identical. The sample was composed of nurses in training of the same cohort and in the same year of training.

The participants completed questionnaires a few days before the training (t_0) and 6 months later (t_1) to evaluate longterm effects of our intervention. The control group completed the same questionnaires in the same period of time. The sample consists at t_0 in total of N = 104 (85 females, 18 males, 1 not reported, M_{age} = 19.96, SD_{age} = 2.56), of which N_{IGt1} = 71 belonged to the intervention group (63 females, 7 males, 1 not reported, M_{age} = 19.77, SD_{age} = 1.57) and N_{CGt0} = 33 belonged to the control group (22 females, 11 males, M_{age} = 20.38, SD_{age} = 3.96). At t_1, the sample consisted of N_{t1} = 94 (74 females, 20 males, M_{age} = 21.06, SD_{age} = 3.14), of which N_{IGt1} = 63 belonged to the intervention group (53 females, 10 males, M_{age} = 20.85, SD_{age} = 2.70) and N_{CGt1} = 31 belonged to the control group (21 females, 10 males, M_{age} = 21.59, SD_{age} = 4.03). For an overview of the sample, see **Table 4.1**.

TABLE 4.1 | Overview sample at t_0 and t_1 (*N*, mean and standard deviation of age).

Measuring points	Overall sample	Control group (CG)	Intervention group (IG)
Measuring point t_0	N = 104, M_{age} = 19.96, SD_{age} = 2.56	$N_{(CG)}$ = 33, $M_{age(CG)}$ = 20.38, $SD_{age(CG)}$ = 3.97	$N_{(IG)}$ = 71, $M_{age(IG)}$ = 19.77, $SD_{age(IG)}$ = 1.58
Measuring point t_1	N = 94, M_{age} = 21.06, SD_{age} = 3.14	$N_{(CG)}$ = 31, $M_{age(CG)}$ = 21.59, $SD_{age(CG)}$ = 4.03	$N_{(IG)}$ = 63, $M_{age(IG)}$ = 20.85, $SD_{age(IG)}$ = 2.71

CG, control group; IG, intervention group; Measuring points: t_0 = Baseline; t_1 = 6 Months after the humor intervention.

Procedure

A few days before the humor intervention took place, all participants (IG + CG) completed a questionnaire that assessed their sense of humor baseline (t_0) including the six sense of humor subscales. Six months after the intervention (t_1) we measured again in both groups the sense of humor as well as the perceived stress, work enjoyment and meaningfulness of work. The intervention group additionally completed short questionnaires immediately before (t_{i0}) and after the training (t_{i1}) to assess changes in positive *(SPANE-P)* and negative affect *(SPANE-N)*. For t_{i1} we additionally measured questions to evaluate the humor intervention with the "*Training Evaluation Inventory (TEI)*" (Level 1: reactions and Level 2: learning and attitude). An overview of the measurement points and the study variables can be seen in **Figure 4.1**. Our study was approved by the local ethics committee at the Ruhr University Bochum, Germany.

Humor Intervention

The humor intervention addresses humor and communication techniques to create a positive relationship with the patient, the patient's relatives as well as with colleagues. It combines practical exercises (e.g., emotion recognition) with subsequent theoretical input, and then reflects on how to translate the learnings into practice. The intervention aims at sensitizing the participants to recognize individual situations of patients in order to then adequately respond to them. The exercises are inspired by scientifically validated exercises on communication and emotion recognition and by positive psychological interventions (e.g., giving compliments) in combination with clown techniques and exercises from the field of theater.

The humor intervention was conducted in a 3-hour workshop in a classroom at the nursing school. The training that we used had been developed 6 years prior by the foundation "Humor Hilft Heilen" (Humour Helps Healing) and had conducted with over 10,000 participants from health care. Also, this training has already been conducted in nursing schools for 3 years. The training is given by humor trainers of the foundation "Humor Hilft Heilen" (Humour Helps Healing). Further modules were developed for the "Care for Joy" project, which are carried out at 6-month intervals over a period of 3 years. As only the evaluation of the first module has been completed so far, the further developed modules are not the subject of this evaluation. The control group did not receive the humor intervention. In terms of content, the humor intervention defined humor and taught basic humorous communication skills in the context of the nursing profession. Also, positive aspects of the nursing profession were identified and the relevance of the nursing profession was worked out. The communication techniques were practiced in group exercises to facilitate the transfer into practice. In order to further consolidate the transfer into practice, the intervention group was given a "homework" exercise on positive patient communication for the training phase.

Study Variables

Sense of Humor

To measure sense of humor, we used the *Sense of Humor Scale* (*SHS*, McGhee, 2010) combined with the *Sense of Humor Scale parallel form* (*SHS-P*, Ruch und Heintz, 2018) as recommended by Ruch and Heintz (2018). Sense of humor showed a very good Cronbach's Alpha at both measuring times (t_0 = .94 and t_1 = .94). Sense of humor consists of the six subscales of *SHS* and *SHS-P* with a total of 48 items. Each of the six subscales contains a total of eight items. The

subscales are *enjoyment of humor* (Cronbach's Alpha: t_0 = .74 and t_1 = .71; example item: "I enjoy funny sketches"), *laughter* (Cronbach's Alpha: t_0 = .79 and t_1 = .82; example items: "I feel comfortable laughing, even when others aren't"), *verbal humor* (Cronbach's Alpha: t_0 = .85 and t_1 = .85; example items: "I often make funny comments"), *finding humor in everyday life* (Cronbach's Alpha: t_0 = .87 and t_1 = .85; example item: "I can get something funny out of a lot of activities"), *laughing at yourself* (Cronbach's Alpha: t_0 = .83 and t_1 = .85; example item: "I find it easy to laugh when I am the butt of the joke") and *humor under stress* (Cronbach's Alpha: t_0 = .89 and t_1 = .90; example item: "My sense of humor is for me a good way to cope with stress"). The items were measured on a 7-point-Likert scale from (1) "strong disapproval" to (7) "strong agreement".

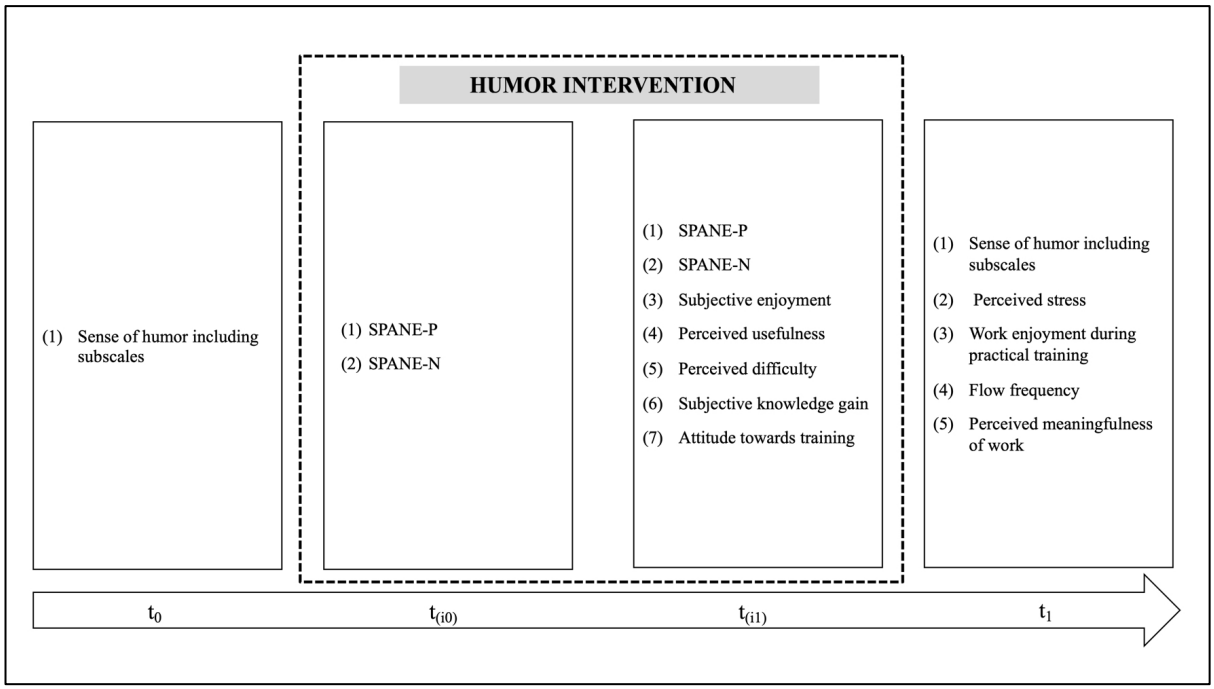

FIGURE 4.1 | Study variables and measuring points. Measuring points: t_0 = Baseline; t_1 = 6 months after the humor intervention; $t_{(i0)}$ = directly before the humor intervention; $t_{(i1)}$ = directly after the humor intervention; SPANE-P, positive affect; SPANE-N, negative affect.

Perceived Stress

Perceived stress was measured with the *Perceived Stress Scale Questionnaire (PSQ)* by Fliege et al. (2001). The *PSQ* (Cronbach's Alpha: t_1 = .85) consists of a total of 20 items, which are divided into four subscales. The subscales of *PSQ* are *tension*, *joy* (with inverted items), *worries* and *demands*. An example item of the *PSQ* is "You feel under pressure from deadlines". The items were measured on a 4-point-Likert scale from (1) "almost never", (2) "sometimes", (3)

"frequently" to (4) "most often". Participants were instructed to relate their answers to their last 4 weeks at work.

Work Enjoyment

We assessed *work enjoyment* with the items of the subscale "*joy*" of the *PSQ* by Fliege et al. (2001). High values represented more work enjoyment during practical training. The Cronbach's Alpha of *work enjoyment during practical training* was t_1= .65. An example item is "You have fun".

Frequency of Flow Experience

The *frequency of flow* was assessed with the Flow Frequency Scale (Bartzik & Peifer, in preparation) which contains 11 items on a 6-point-Likert scale with (1) "never", (2) "almost never", (3) "sometimes", (4) "often", (5) "very often", (6) "(almost) always". The instructions of the Flow Frequency items were: "Below you will find a number of questions about your daily work experience. Please rate how often or rarely you have had the experience in the last two weeks." An example item reads: "How often have you experienced in the last 2 weeks at work that you were surprised how quickly time passed." The Cronbach's Alpha (t_1) can be described as very good with α = .87. The scale can be found in **Supplementary Table S4.1**.

Perceived Meaningfulness of Work

Perceived meaningfulness of work was measured with seven self-generated items, which are measured on a 6-point-Likert scale from (1) "do not agree" to (6) "fully agree" An example item of the perceived importance of the work is "My work is meaningful". Cronbach's Alpha was very good with α = .85). The scale can be found in **Supplementary Table S4.2**.

Positive and Negative Affect

Positive and negative affect were assessed with the *Scale of Positive and Negative Experience (SPANE)* by Diener et al. (2009) with a total of 12 items. For the humor intervention we adapted the instructions in "Please mark with a cross how you feel now, at this moment, according to the terms listed below". Positive affect (*SPANE-P*; Cronbach's Alpha: $t_{(i0)}$ = .87 and $t_{(i1)}$ = .93; example item: "positive") and negative affect (*SPANE-N*; Cronbach's Alpha: $t_{(i0)}$ = .88 and $t_{(i1)}$

= .82; example item: "sad") were measured with six items each on a 5-point-Likert scale from (1) "not at all", (3) "neutral" to (5) "very".

Evaluation of the Humor Intervention

The reactions, learning experiences and attitudes regarding the humor intervention were measured with the Training Evaluation Inventory (TEI) by Ritzmann et al. (2014) with 17 items. To evaluate the humor intervention, we used the scales for training outcome dimensions (subjective enjoyment (Cronbach's Alpha: $t_{(i1)}$ = .85), perceived usefulness (Cronbach's Alpha: $t_{(i1)}$ = .85), perceived difficulty (Cronbach's Alpha: $t_{(i1)}$ = .83), subjective knowledge gain (Cronbach's Alpha: $t_{(i1)}$ = .86), and attitude towards training (Cronbach's Alpha: $t_{(i1)}$ = .72). The subscales subjective enjoyment (example item: "Learning was fun"), perceived usefulness (example item: "Investing time in this intervention was useful") and perceived difficulty (example item: "The contents were understandable") represent level 1 (reactions) and level 2 (learning and attitude) are described with the subscales subjective knowledge gain (example item: "I will be able to remember the new topics well") and attitude towards training (example item: "I will apply what I have learned in my daily work"). The items were assessed on a 5-point-Likert scale from (1) "does not apply at all" to (5) "fully applies".

Data Analysis

The data was analyzed using IBM SPSS statistics 26. To test the effectiveness of the intervention over time, we performed a repeated measures ANOVA in which we compared the intervention and control group with respect to their changes in their sense of humor from t_0 to t_1. The same approach was used with the subscale's *enjoyment of humor*, *laughter*, *verbal humor*, *finding humor in everyday life*, *laughing at yourself* and *humor under stress*. To assess the effect of the intervention on positive and negative affect, we used a paired t-test and report the effect size d_z (difference of the mean value of both measuring times divided by the standard deviation). In all analyses, we defined a significance level of $p < .050$ to report statistically significant results. The mediation hypotheses were tested with the macro PROCESS by Hayes (2018). All variables in the mediation models were z-standardized. According to Preacher and Hayes (2008), the indirect effect *ab* was estimated to evaluate whether the humor intervention had an indirect effect *via* the sense of humor (t_1) on the hypothesized outcome variables (perceived stress, frequency of flow and perceived meaning). We report a 95% confidence interval ($n_{bootstrap}$ = 5000) for the indirect effect.

Results

Descriptive Data and Intercorrelations

The descriptive data of the study variables divided into overall, intervention and control group for the measurement times t_0 and t_1 are presented in **Table 4.2**, and the intercorrelations can be taken from **Table 4.5**.

Reactions, Subjective Learning Gain, and Attitude Toward the Humor Intervention

The humor intervention for the intervention group ($N_{IG} = 70$) shows descriptive values from $M = 4.00$ to $M = 4.63$ for the different training outcome dimensions, which shows an overall very positive assessment of our intervention by the participants. An overview of the descriptive values of the training outcome dimensions of Level 1 (reactions) and Level 2 (learning and attitudes) is shown in **Table 4.3**.

Affect Before and After the Humor Intervention

Positive affect ($M_{t(i0)} = 3.49$, $SD_{t(i0)} = 0.59$; $M_{t(i1)} = 3.91$, $SD_{t(i1)} = 0.75$) was significantly increased after the humor intervention ($t_{(66)} = 5.81$, $p < .001$, $d_z = 0.71$), while negative affect was significantly decreased ($M_{t(i0)} = 1.49$, $SD_{t(i0)} = 0.61$; $M_{t(i1)} = 1.23$, $SD_{t(i1)} = 0.37$) after humor intervention ($t_{(66)} = -4.28$, $p < .001$. $d_z = -0.52$). The humor intervention resulted in an increase in positive affect and a decrease in negative affect (see **Figure 4.2**). The intercorrelations of acute changes in positive affect and negative affect due the humor intervention with sense of humor and its subscales, as well as perceived stress, work enjoyment, frequency of flow experience, and perceived meaningfulness of work as measured at t_1, are depicted in **Table 4.4**.

Testing the Effectiveness of the Humor Intervention

First of all, there are significant effects of time in the overall group, showing that the sense of humor decreases from t_0 to t_1: Those significant main effects of time were found for *sense of humor* ($F_{(1, 73)} = 8.51$, $p = .005$, $\eta^2 = .104$), as well as for the subscales *finding humor in everyday life* ($F_{(1, 73)} = 7.69$, $p = .007$, $\eta^2 = .095$), *laughter* ($F_{(1, 73)} = 8.39$, $p = .005$, $\eta^2 = .103$), and *enjoyment of humor* ($F_{(1, 73)} = 8.22$, $p = .005$, $\eta^2 = .101$). There are no significant main effects over time for *humor under stress* ($F_{(1, 73)} = 1.29$, $p = .260$, $\eta^2 = .017$), *verbal humor* ($F_{(1, 73)} =$

2.28, $p = .135$, $\eta^2 = .030$), and *laughing at yourself* ($F_{(1, 73)} = 3.46$, $p = .067$, $\eta^2 = .045$). The group had no significant main effects.

TABLE 4.2 | Shows means and standard deviations of all study variables.

	Variable	*M (N)*	*SD*	M_{CG} (N_{CG})	SD_{CG}	M_{IG} (N_{IG})	SD_{IG}
		Overall sample		**Control group (CG)**		**Intervention group (IG)**	
1	Sense of humor (t_0)	4.91 (104)	0.78	4.88 (33)	0.54	4.92 (71)	0.88
2	Sense of humor (t_1)	4.73 (94)	0.79	4.50 (31)	0.64	4.84 (63)	0.84
3	Enjoyment of humor (t_0)	4.39 (104)	0.97	4.44 (33)	0.88	4.37 (71)	1.02
4	Enjoyment of humor (t_1)	4.18 (94)	0.90	4.02 (31)	0.85	4.26 (63)	0.92
5	Finding humor in everyday life (t_0)	5.19 (104)	0.96	5.11 (33)	0.65	5.22 (71)	1.08
6	Finding humor in everyday life (t_1)	4.97 (94)	0.94	4.70 (31)	0.74	5.10 (63)	1.00
7	Laughing at yourself (t_0)	5.41 (104)	0.99	5.28 (33)	0.81	5.47 (71)	1.07
8	Laughing at yourself (t_1)	5.18 (94)	0.99	4.82 (31)	0.93	5.35 (63)	0.97
9	Laughter (t_0)	5.25 (104)	0.93	5.17 (33)	0.79	5.29 (71)	1.00
10	Laughter (t_1)	4.93 (94)	0.99	4.85 (31)	0.94	4.98 (63)	1.00
11	Verbal humor (t_0)	4.42 (104)	1.22	4.59 (33)	0.88	4.37 (71)	1.34
12	Verbal humor (t_1)	4.41 (94)	1.11	4.25 (31)	0.73	4.49 (63)	1.25
13	Humor under stress (t_0)	4.78 (104)	1.12	4.68 (33)	0.96	4.83 (71)	1.20
14	Humor under stress (t_1)	4.68 (94)	1.07	4.35 (31)	0.88	4.84 (63)	1.13
15	Perceived stress (t_1)	2.27 (94)	0.41	2.30 (31)	0.36	2.26 (63)	0.44
16	Work enjoyment during practical training (t_1)	2.63 (94)	0.53	2.49 (31)	0.41	2.70 (63)	0.58
17	Flow frequency (t_1)	3.95 (93)	0.71	3.83 (30)	0.67	4.01 (63)	0.72
18	Perceived meaningfulness of work (t_1)	4.82 (94)	0.83	4.68 (31)	0.81	4.88 (63)	0.84

Scale-Range (1-7) = Sense of humor, Enjoyment of humor, Finding humor in everyday life, Laughing at yourself, Laughter, Verbal humor, Humor under stress; (1-4) = Perceived Stress, Work enjoyment during practical; (1-6) = Flow frequency, Perceived Meaningfulness of work; CG, control group; IG, intervention group; Measuring points: t_0 = Baseline; t_1 = 6 months after the humor intervention.

TABLE 4.3 | Shows means and standard deviations of the training outcome dimensions.

Variable	*M*	*SD*
Training outcome dimensions		
Level 1 (reactions)		
1 Subjective enjoyment	4.25	0.67
2 Perceived usefulness	4.27	0.68
3 Perceived difficulty	4.63	0.47
Level 2 (learning and attitude)		
4 Subjective knownledge gain	4.00	0.76
5 Attitude towards training	4.26	0.64

Measured with the TEI (Ritzmann et al., 2014) on a 5-point Likert scale directly after the humor intervention ($t_{(i1)}$).

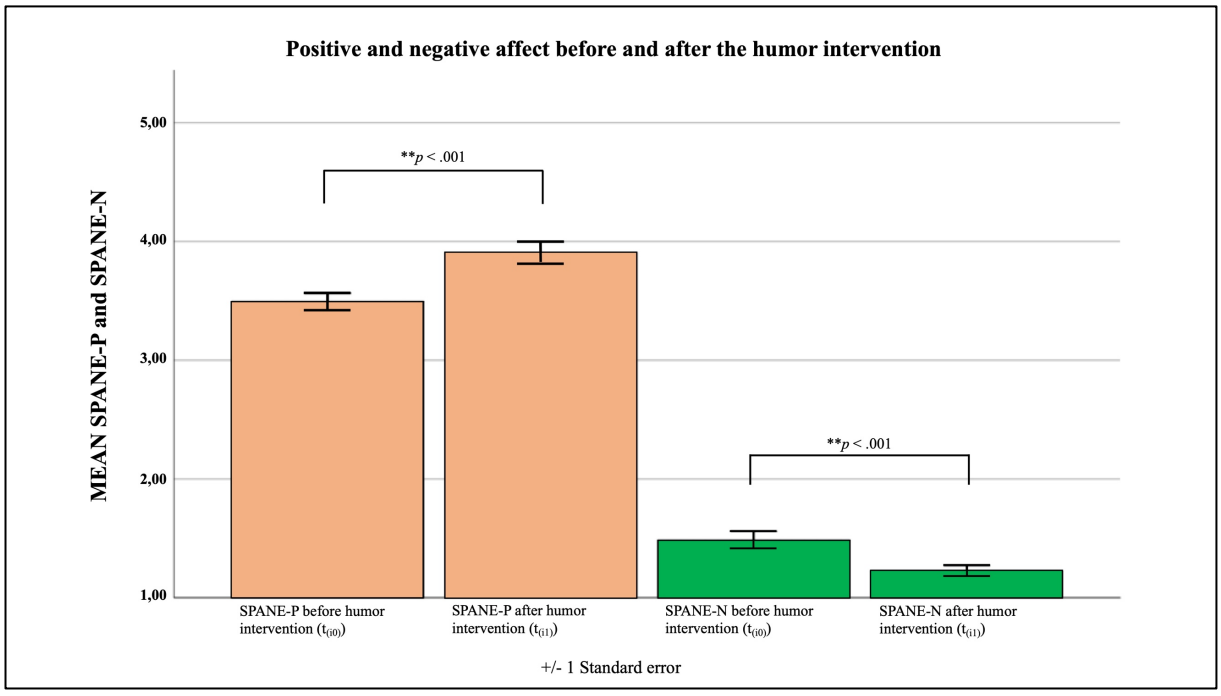

FIGURE 4.2 | Affect before and after the humor intervention in the intervention group; SPANE-P, positive affect; SPANE-N, negative affect; Measuring points: $t_{(i0)}$ = directly before the humor intervention; $t_{(i1)}$ = directly after the humor intervention.

Testing Hypothesis 1: The humor intervention has a positive effect on the nurses' sense of humor and the six sense of humor habits.

To test hypothesis 1, we looked at the interaction effects of time*group on the sense of humor variables from t_0 to t_1. Significant interaction effects were found on *sense of humor* ($F_{(1, 73)}$ = 6.26, p = .015, η^2 = .079; see **Figure 4.3**), as well as on the subscales *finding humor in everyday life* ($F_{(1, 73)}$ = 5.29, p = .024, η^2 = .068) and *verbal humor* ($F_{(1, 73)}$ = 10.94, p = .001, η^2 = .130). On these (sub)scales it was shown that sense of humor decreased from t_0 to t_1 in the control group, while it remained stable over time in the intervention group.

For *humor under stress* ($F_{(1, 73)}$ = 2.20, p = .142, η^2 = .029), *laughing at yourself* ($F_{(1, 73)}$ = 2.34, p = .130, η^2 = .031), *laughter* ($F_{(1, 73)}$ = 0.04, p = .842, η^2 = .001), and *enjoyment of humor* ($F_{(1, 73)}$ = 2.80, p = .099, η^2 = .037) no interaction effects with group and time could be found.

Testing Hypothesis 2: Sense of humor mediates the effect of the humor intervention on perceived stress.

In the mediation model of hypothesis 2, the humor intervention (t_0) is the independent variable, sense of humor (t_1) is the mediator and perceived stress (t_1) the dependent variable. The *a*-path (β = .20, *SE* = 0.10, *t* = 2.00, *p* = .049) and *b*-path (β = -.22, *SE* = 0.10, *t* = -2.10, *p* = .039) were both significant. However, neither the total effect (β = -.04, *SE* = 0.10, *t* = -0.42, *p* = .673), nor the direct effect (β = .00, *SE* = 0.10, *t* = 0.01, *p* = .996) or the indirect effect (β = -.04, *SE* = 0.03, -0.11 < CI < 0.00) were significant. Accordingly, hypothesis 2 could not be confirmed (see **Figure 4.4**).

TABLE 4.4 | Intercorrelation of difference scores of affect at t_i with work experience 6 months after the humor intervention.

Variable		1	2	3	4	5	6	7	8	9	10	11	12	13
1	Difference scores positive affect through humor intervention (t_{i1}- t_{i0})	1												
2	Difference scores negative affect through humor intervention (t_{i1}- t_{i0})	-.36 **	1											
3	Sense of humor (t_1)	.11	-.03	1										
4	Enjoyment of humor (t_1)	.29 *	-.04	.52 **	1									
5	Laughter (t_1)	.10	-.05	.84 **	.41 **	1								
6	Verbal humor (t_1)	-.00	-.09	.86 **	.32 *	.63 **	1							
7	Finding humor in everyday life (t_1)	.05	-.05	.92 **	.31 *	.73 **	.80 **	1						
8	Laughing at yourself (t_1)	.00	-.00	.81 **	.33 **	.62 **	.64 **	.75 **	1					
9	Humor under stress (t_1)	.12	.08	.82 **	.23	.62 **	.66 **	.76 **	.56 **	1				
10	Perceived stress (t_1)	-.05	.04	-.21	-.12	-.25	-.07	-.11	.33 **	-.18	1			
11	Work enjoyment during practical training (t_1)	.36 *	.07	.35 **	.24	.32 **	.22	.28 *	.26 *	.36 **	-.53 **	1		
12	Flow frequency (t_1)	.23	-.06	.35 **	-.02	.27 *	.26 *	.33 **	.27 *	.51 **	-.27 *	.56 **	1	
13	Perceived meaningfulness of work (t_1)	.22	-.02	.41 **	.06	.27 *	.37 **	.43 **	.36 **	.45 **	-.33 **	.58 **	.43 **	1

***p < .001; *p < .050; Measuring points: t_{i1}- t_{i0} = Difference scores: measures are taken immediately before and immediately after the humor intervention; t_1 = 6 months after the humor intervention.*

TABLE 4.5 | Intercorrelation of all study variables.

Variable		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Sense of humor (t_0)	1																	
2	Sense of humor (t_1)	.74 **	1																
3	Enjoyment of humor (t_0)	.47 **	.30 **	1															
4	Enjoyment of humor (t_1)	.42 **	.54 **	.66 **	1														
5	Laughter (t_0)	.74 **	.61 **	.33 **	.39 **	1													
6	Laughter (t_1)	.57 **	.82 **	.19	.43 **	.77 **	1												
7	Verbal humor (t_0)	.83 **	.64 **	.25 *	.23 *	.51 **	.41 **	1											
8	Verbal humor (t_1)	.64 **	.84 **	.20	.32 **	.46 **	.63 **	.72 **	1										
9	Finding humor in everyday life (t_0)	.90 **	.65 **	.19	.22	.57 **	.45 **	.80 **	.57 **	1									
10	Finding humor in everyday life (t_1)	.72 **	.89 **	.16	.30 **	.57 **	.66 **	.67 **	.74 **	.74 **	1								
11	Laughing at yourself (t_0)	.79 **	.65 **	.11	.24 *	.55 **	.51 **	.63 **	.54 **	.77 **	.65 **	1							
12	Laughing at yourself (t_1)	.58 **	.82 **	.10	.29 **	.35 **	.60 **	.53 **	.62 **	.57 **	.76 **	.72 **	1						
13	Humor under stress (t_0)	.80 **	.51 **	.28 **	.23 *	.44 **	.32 **	.57 **	.41 **	.76 **	.50 **	.54 **	.33 **	1					
14	Humor under stress (t_1)	.56 **	.81 **	.16	.28 **	.37 **	.55 **	.43 **	.62 **	.54 **	.75 **	.43 **	.61 **	.60 **	1				
15	Perceived stress (t_1)	-.12	-.22 *	.02	-.02	-.12	-.23 *	-.07	-.09	-.13	-.18	-.19	-.33 **	-.08	-.21 *	1			
16	Work enjoyment during practical training (t_1)	.21	.38 **	.13	.19	.28 *	.36 **	.05	.26 *	.16	.33 **	.10	.31 **	.24 *	.37 **	-.56 **	1		
17	Flow frequency (t_1)	.18	.42 **	-.01	.08	.22	.35 **	.11	.27 **	.19	.39 **	.08	.37 **	.23	.50 **	-.26 *	.54 **	1	
18	Perceived meaningfulness of work (t_1)	.36 *	.41 **	.08	.03	.27 *	.28 **	.27 *	.31 **	.35 **	.46 **	.36 **	.40 **	.30 **	.45 **	-.37 **	.58 **	.48 **	1

***p < .001; *p < .050; Measuring points: t_0 = Baseline; t_1 = 6 months after the humor intervention.*

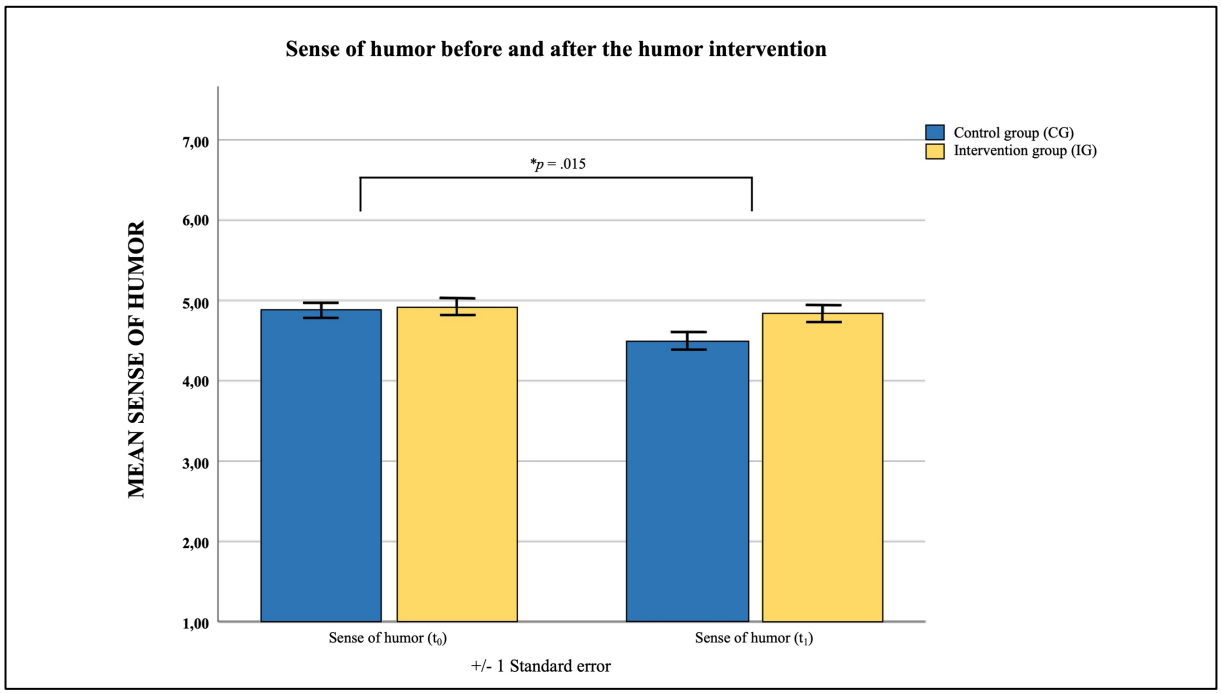

FIGURE 4.3 | Sense of humor before and after the humor intervention comparing control group (CG) and intervention group (IG); Measuring points: t_0 = Baseline; t_1 = 6 months after the humor intervention; the interaction effect (p = .015) indicated that sense of humor decreased from t_0 to t_1 in the control group, but remained stable in the intervention group.

Testing Hypothesis 3: Sense of humor mediates the effect of the humor intervention on work enjoyment during practical training.

To test hypothesis 3, the mediation model includes the humor intervention (t_0) as independent variable, the sense of humor (t_1) as mediator, and work enjoyment (t_1) as dependent. We could show significant results for the *a*-path (β = .20, *SE* = 0.10, *t* = 2.00, *p* = .049) and *b*-path (β = .36, *SE* = 0.10, *t* = 3.68, *p* < .001). The total effect (β = .18, *SE* = 0.10, *t* = 1.76, *p* = .082) and direct effect (β = .11, *SE* = 0.10, *t* = 1.09, *p* = .280) were not significant. However, we could show a significant indirect effect (β = .07, *SE* = 0.04, 0.01 < CI < 0.15). Sense of humor thus mediates a positive effect of the humor intervention on work enjoyment (see **Figure 4.5**).

Testing Hypothesis 4: Sense of humor mediates the effect between the group and Flow Frequency.

In the mediation model the humor intervention (t_0) is the independent variable, sense of humor (t_1) is the mediator, and the frequency of flow (t_1) is the dependent variable. While the *a*-path (β = .20, *SE* = 0.10, *t* = 1.94, *p* = .055) was just barely not significant, the *b*-path (β = .41, *SE* =

0.09, $t = 4.18$, $p < .001$) was significant. The total effect (β = .12, $SE = 0.10$, $t = 1.20$, $p = .235$) and the direct effect (β = .04, $SE = 0.10$, $t = 0.44$, $p = .662$) were not significant. However, we found a significant indirect effect (β = .08, $SE = 0.04$, $0.01 < CI < 0.17$) in the mediation model. The sense of humor thus transmits a positive effect of the humor intervention on flow frequency. For an overview, see **Figure 4.6**.

Testing Hypothesis 5: Sense of humor mediates the effect between the group and the perceived meaningfulness of work.

The mediation model involved sense of humor (t_1) as mediator and the perceived meaningfulness of the work (t_1) as dependent variable. The independent variable in the mediation model is the humor intervention (t_1). We could show significant results for the *a*-path (β = .20, $SE = 0.10$, $t = 2.00$, $p = .049$) and *b*-path (β = .41, $SE = 0.10$, $t = 4.17$, $p < .001$). The total effect (β = .12, $SE = 0.10$, $t = 1.12$, $p = .264$) and the direct effect (β = .03, $SE = 0.10$, $t = 0.34$, $p = .732$) were not significant. However, we could show a significant indirect effect (β = .08, $SE = 0.04$, $0.01 < CI < 0.17$). It can be concluded that sense of humor mediates a positive effect of the humor intervention on the perceived meaningfulness of work (see **Figure 4.7**). For an overview of the results of hypotheses 2 to 5, see **Table 4.6**.

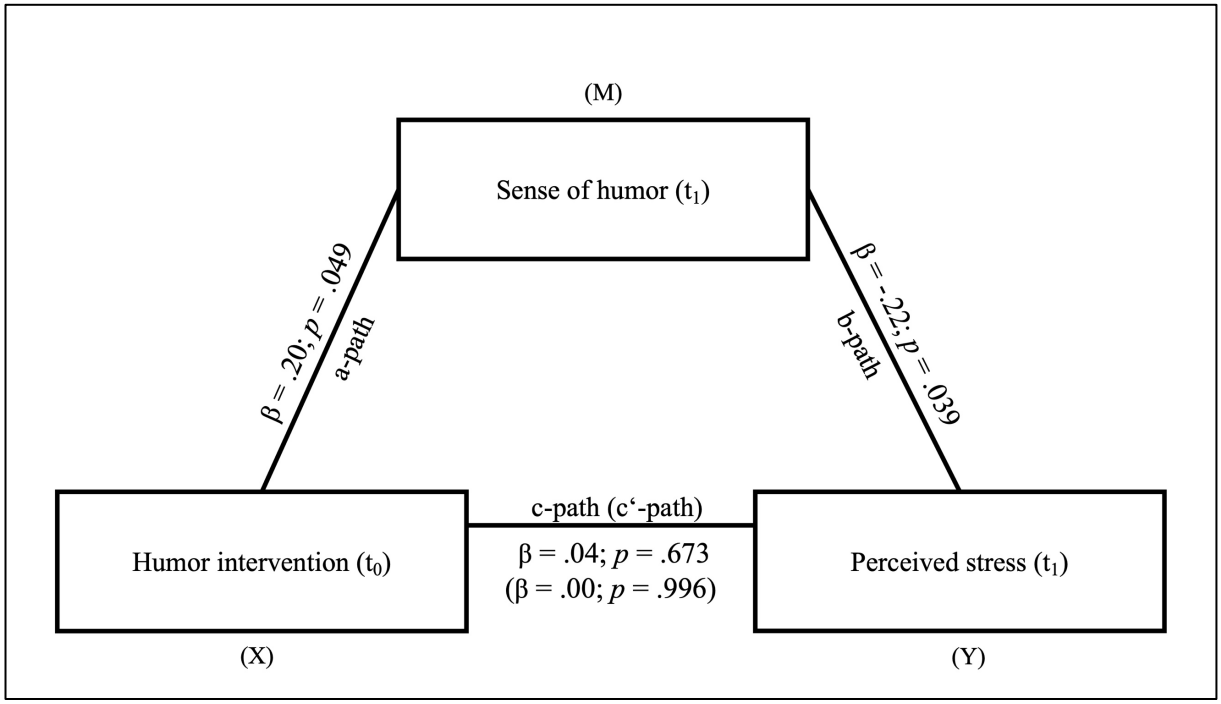

FIGURE 4.4 | Mediation model of the effect of the humor intervention (X) on perceived stress (Y) *via* sense of humor (M). *N* = 94. The indirect effect from (X = independent variable) to (Y = dependent variable) *via* (M = mediator) was significant (β = -.04, *SE* = 0.03, -0.11 < *CI* < 0.00); Measuring points: t_0 = Baseline; t_1 = 6 months after the humor intervention.

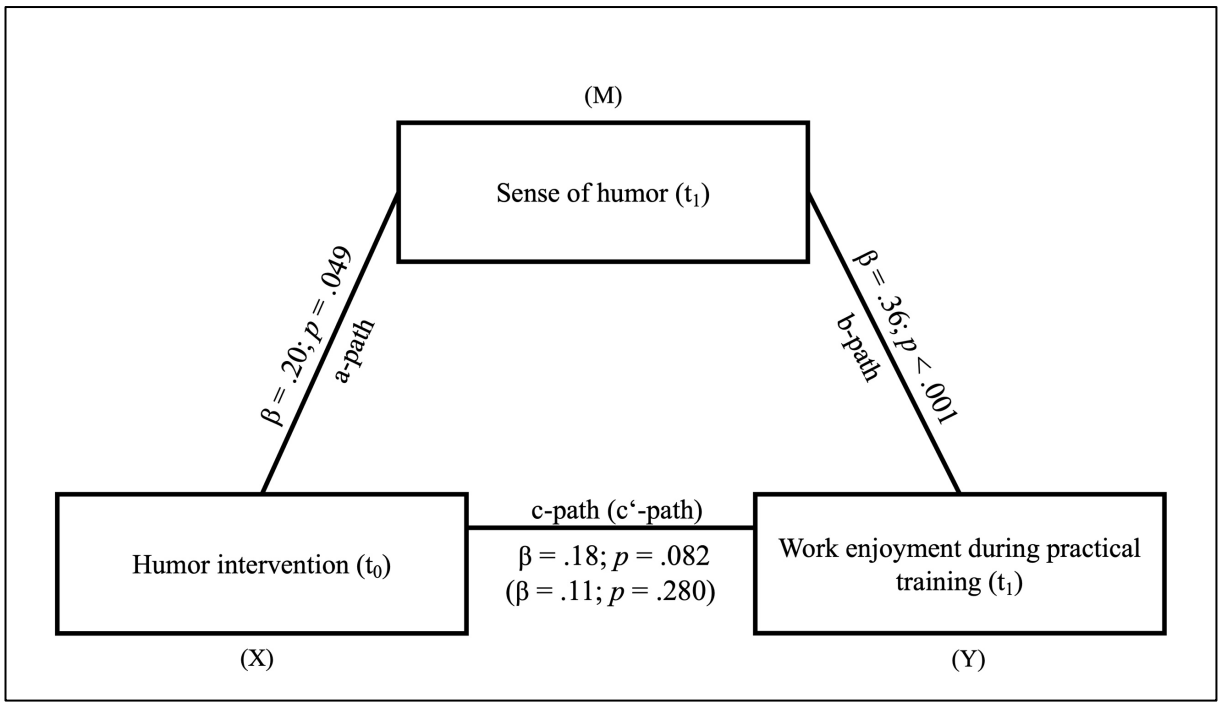

FIGURE 4.5 | Mediation model of the effect of the humor intervention (X) on work enjoyment during practical training (Y) *via* sense of humor (M). *N* = 94. The indirect effect from (X = independent variable) to (Y = dependent variable) *via* (M = mediator) was significant (β = .07, *SE* = 0.04, 0.01 < *CI* < 0.15); Measuring points: t_0 = Baseline; t_1 = 6 months after the humor intervention.

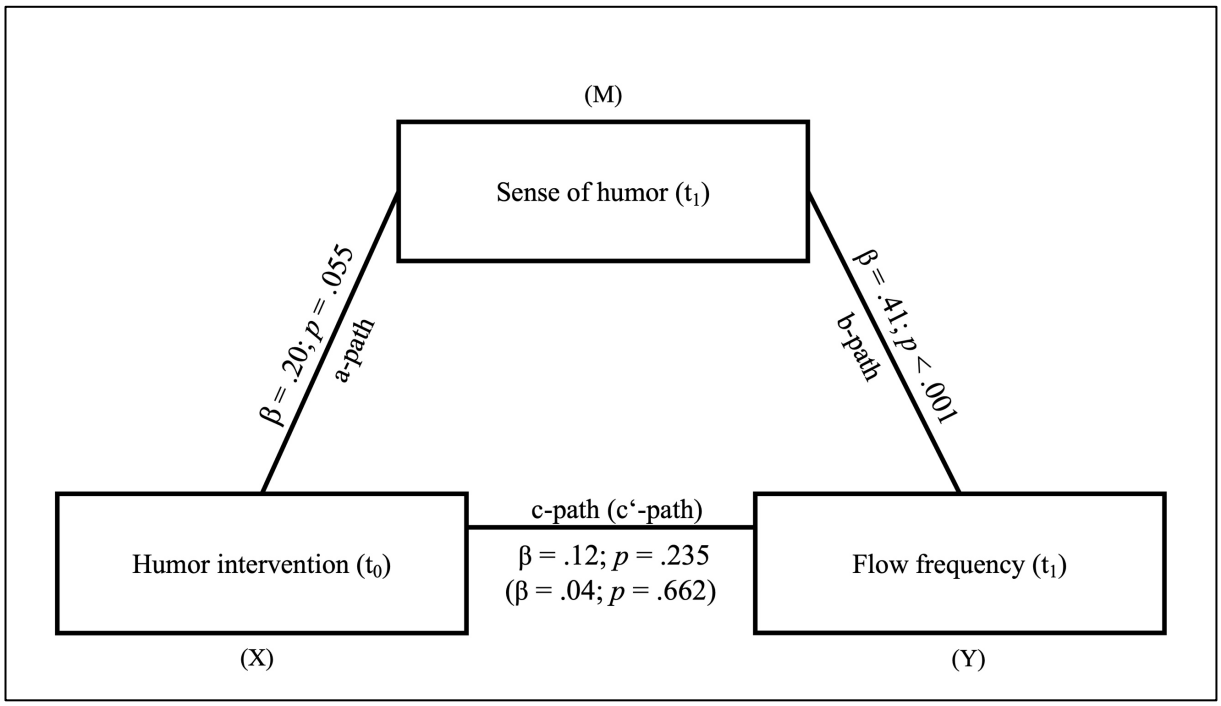

FIGURE 4.6 | Mediation model of the effect of the humor intervention (X) on flow frequency (Y) *via* sense of humor (M). *N* = 93. The indirect effect from (X = independent variable) to (Y = dependent variable) *via* (M = mediator) was significant (β = .08, *SE* = 0.04, 0.01 < *CI* < 0.17); Measuring points: t_0 = Baseline; t_1 = 6 months after the humor intervention.

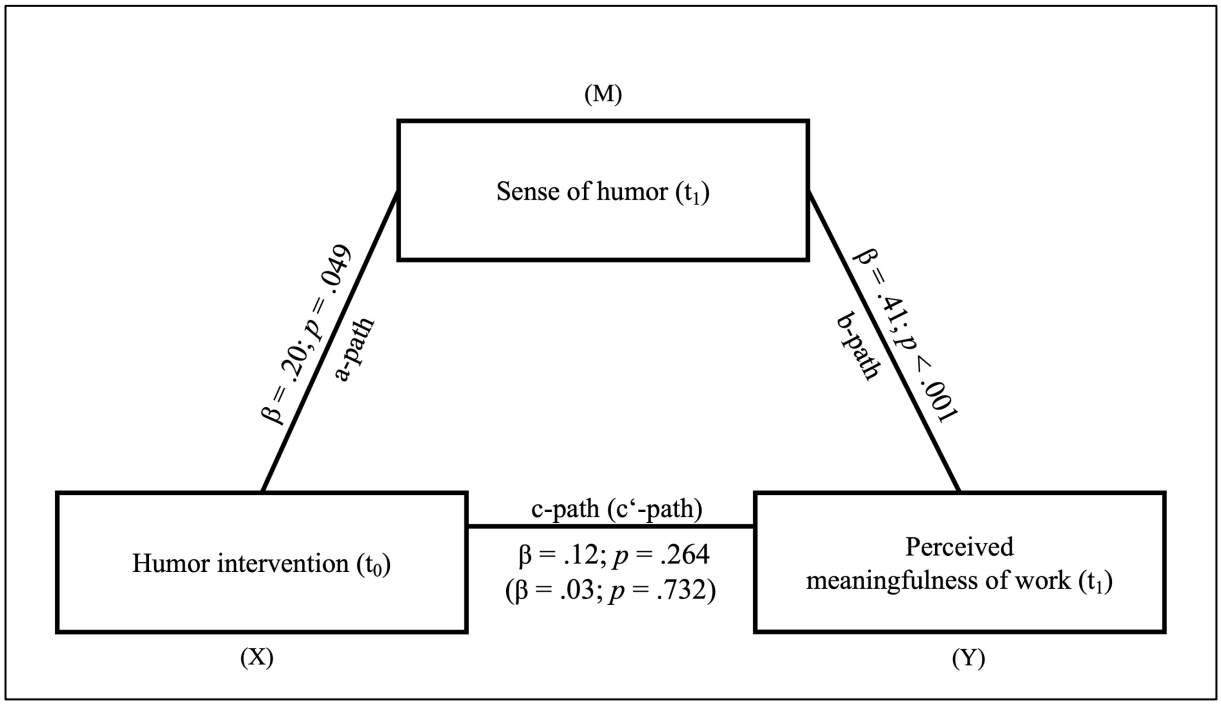

FIGURE 4.7 | Mediation model of the effect of the humor intervention (X) on perceived meaningfulness of work (Y) *via* sense of humor (M). *N* = 94. The indirect effect from (X = independent variable) to (Y = dependent variable) *via* (M = mediator) was significant (β = .08, *SE* = 0.04, 0.01 < *CI* < 0.17); Measuring points: t_0 = Baseline; t_1 = 6 months after the humor intervention.

TABLE 4.6 | Mediation models of the effect of the humor intervention (X) via sense of humor (M) on the dependent variable (Y).

	a-path				*b*-path				*c*-path				*c'*-path				indirect effect
Variable (Y)	**β**	***SE***	***t***		**β**	***SE***	***t***		**β**	***SE***	***t***		**β**	***SE***	***t***		**β*; CI***
Perceived stress (H2)	.20	0.10	2.00	*	-.22	0.10	-2.10	*	.04	0.10	-0.42	n.s.	.00	0.10	0.01	n.s.	β = -.04; -0.11 <CI < 0.00
Work enjoyment during practical training (H3)	.20	0.10	2.00	*	.36	0.10	1.76	**	.18	0.10	1.76	n.s.	.11	0.10	1.09	n.s.	β = .07; 0.07 <CI < 0.15
Flow frequency (H4)	.20	0.10	1.94	n.s.	.41	0.09	4.18	**	.12	0.10	1.20	n.s.	.04	0.10	0.44	n.s.	β = .08; 0.01 <CI < 0.17
Perceived meaningfulness of work (H5)	.20	0.10	2.00	*	.41	0.10	4.17	**	.12	0.10	1.12	n.s.	.03	0.10	0.34	n.s.	β = .08; 0.01 <CI < 0.17

*(H), Hypothesis; n.s., not significant; ** p < .001; * p < .050; X = independent variable (IG vs CG); M = mediator (sense of humor); Y = dependent variable.*

Discussion

Summary of Results

In this study, we examined the effect of a humor intervention on the sense of humor in an intervention group with nurses in training, while a control group received no intervention. We were able to show in the results that the humor intervention had a protective effect on sense of humor in the intervention group, while the sense of humor in the control group decreased over a 6-month period. In addition, we found that the sense of humor mediated the effect of the humor intervention on work enjoyment, frequency of flow experience, and perceived meaningfulness of work. The sense of humor did not mediate the effect of the humor intervention on perceived stress. However, a direct negative effect of sense of humor on perceived stress was shown in the mediation model. Furthermore, we found that the humor intervention acutely increased positive affect and decreased negative affect. On a descriptive level of analysis, the nurses in training in the intervention group reported that they enjoyed the humor intervention, and the content of the humor intervention was also evaluated as useful for the nursing profession. Additionally, they rated the content of the humor intervention as easy to understand. The attitude toward the humor intervention was very positive and the humor intervention led to a subjective knowledge gain regarding its content. The nurses in training reported that their knowledge has expanded in the long term as a result of the humor intervention and that they are able to remember the content of the humor intervention well. It can be concluded that the implementation of the humor intervention in the context of nursing work was rated as very positive overall. Furthermore, we found positive correlations between the acute change in positive affect due to the intervention with enjoyment of humor and work enjoyment 6 months later.

Discussion of the Hypotheses

In Hypothesis 1 we had postulated that the humor intervention would have a positive effect on the nurses' sense of humor and the six sense of humor habits. However, this was not exactly what we found: Instead of finding an increase of the sense of humor in the intervention group, we found it to be stable while it decreased in the control group. The finding of a decreased sense of humor in the group without intervention is, however, in line with other findings that, over the time of professional training, nurses show a decreased work satisfaction (Ma et al., 2003) and even the tendency to quit work (Cortese, 2007), so such kinds of decreases are a typical

although alarming phenomenon of the profession. Thus, we consider our finding that the humor intervention keeps the sense of humor stable during a 6-month post-measurement compared to a control group as a positive result that confirms Hypothesis 1. The finding is that sense of humor can be positively affected through training and is consistent with results from other studies (Crawford & Caltabiano, 2011; Hofmann & Giuliani, 2019). We found the same result for some subscales of the sense of humor: "finding humor in everyday life" and "verbal humor". This finding is highly plausible as the evaluated first module of our humor intervention addressed particularly positive communication in the nursing profession. The positive effect on the sense of humor habit "*verbal humor*" is promising here, as it improves people's communication skills and thus their ability to deal with conflicts (McGhee, 2010a). Its use will probably make it easier for nurses in training to establish contact with patients in the future. The sense of humor habit *finding humor in everyday life* can also help nurses in training to further develop the sense of humor in the future (McGhee, 2010a). For the subscale's *enjoyment of humor*, *laughing at yourself, laughte*r and *humor under stress*, we could not report any change due to our humor intervention. Later modules of the intervention will focus on other aspects of the sense of humor; at present, their effects on the outcome variables remain to be tested.

Our results of hypothesis 2— that sense of humor mediates the effect of the humor intervention on perceived stress—was not confirmed, as the indirect effect was not significant. However, both the a-path and b-path of the mediation model were significant in the predicted direction, i.e., the humor intervention had a positive effect on the sense of humor at t_1 (a-path) and the sense of humor had a negative effect on perceived stress (b-path). Possibly, the sample size and, thus, the power of our study were not large enough to detect an existing effect. Furthermore, the focus of the intervention was on positive communication and contact with the patient. One study shows that direct contact with patients can be a stressor for nurses, but other stress factors can also be identified in the nursing profession, such as emotional demands from patients, uncomfortable work environments, time pressure or administrative responsibilities (McGrath et al., 2003). Accordingly, a multitude of stressors influenced the perception of stress, and future interventions should also address other potential stressors. We must also point out that stress management will be dealt with at a later stage in our training series "*Care for joy,*" and we might be able to confirm hypothesis 3 at a later point in time. Still, the finding that sense of humor was negatively associated with perceived stress (b-path) is nevertheless consistent with previous studies on humor and stress (see e.g. Bennett, 2003; Martin, 2004; Martin & Lefcourt,

1983; McGhee, 2010; Putz & Breuer, 2017) and underlines the potential of sense of humor as a coping strategy.

The results in this study confirm Hypothesis 3, i.e., that our humor intervention has an indirect effect on work enjoyment *via* sense of humor. This result is consistent with the results that the use of humor in the workplace can lead to greater work enjoyment (Ghaffari et al., 2015). Such an increase in work enjoyment is associated with positive consequences such as increased performance and reduced psychological stress (Graves et al., 2012).

Furthermore, our study provides additional results on the as-yet scarce research on the relationship between humor and flow experience. The postulated indirect effect of the humor intervention *via* sense of humor on the frequency of flow (Hypothesis 4) could be confirmed. The effect of sense of humor on the frequency of flow experience is consistent with the results of the studies by Plester and Hutchison (2016) and Bakker and van Woerkom (2017), which described fun as a predictor for achieving flow experience. In the study by van Oortmerssen and colleagues (2020) a small correlation between flow and humor was found, but no further effects of humor and flow could be reported. Our results are particularly relevant for the work context, because well-being (Asakawa, 2004, 2010; Bartzik et al., 2020; Bassi et al., 2014; Rivkin et al., 2018) and job satisfaction (Maeran & Cangiano, 2013) are positively influenced by flow experience.

Hypothesis 5, which postulated that the sense of humor mediates the effect of the humor intervention on the perceived meaningfulness of work, was also confirmed. To our knowledge, there are no studies so far that have investigated the relationship between perceived meaningfulness of work and humor. This study thus gives a first empirical support of this association. This association is in line with humor as a character strength belonging to the category of transcendence strengths (Peterson & Seligman, 2004). Transcendence strengths in the character strength model are defined as strengths that create meaning. Humor may help to look at the positive sides of life, and humor may similarly help people to perceive the good sides of their own profession. In sum, hypotheses 2-5 provided evidence that sense of humor positively affects workplace experience. As outlined in the introduction, humor is related to positive emotions, which act as a buffer towards stress (McGhee, 2010b). The association of humor with positive emotions is also reflected in the brain: for example an MRI study reported that humor causes activation in the mesolimbic dopaminergic reward system (Mobbs et al., 2003) and rewards can lead to positive experiences such as positive emotions and joy (Schultz, 2015). Furthermore, humor was found to reduce the stress hormone cortisol (Savage et al.,

2017). In line with this, individuals who use humor as a stress coping method are more likely to see stressful situations as a challenge rather than a threat (Martin & Ford, 2018). Through such a stress-buffering effect, which is even visible physiologically, humor can contribute to positive work experiences and to an increase in job satisfaction (Khamisa et al., 2017).

Implications for Nursing

Our results provide first, but promising evidence that humor interventions can have a positive impact when included in the training curriculum for prospective nurses. Sense of humor in the nursing context has many positive effects, such as reduced stress, increased work enjoyment, frequency of flow and perceived meaningfulness of work. Therefore, one could also expect positive effects of humor interventions, not only for nurses in training, but also for trained nurses and other health care professionals like physicians and therapists.

In future implementations of the humor interventions, a booster/refresher session after the humor intervention could be helpful to consolidate learnings for more pronounced results. Refreshers have been shown to significantly increase training effectiveness (Kluge & Frank, 2014). A potential refreshing intervention could be implemented using an accompanying mobile app. Such a mobile app could be used to send brief exercises to the participants which could help to ensure transfer into practice. Also, this app could contain summaries from the humor intervention and a forum in which users can share and discuss their experiences.

In general, literature shows that humor leads to an increase in well-being (Cann & Collette, 2014; Crawford & Caltabiano, 2011; Jiang et al., 2020; Proyer et al., 2010), which, however, depends on different humor styles: for example aggressive humor and self-defeating humor can even lead to a decrease in well-being (Jiang et al., 2020). Accordingly, it is even more important that nurses are trained on the topic of humor, so that the humor styles hindering for well-being in the work context can be consciously avoided. Misapplied humor, also called “the dark side of humor,” can also have a negative impact on relationships between colleagues at work (Plester, 2016). On the other hand, good forms of humor can contribute to positive relationship building among colleagues (Beck, 1997). Positive relationships at work are important resources, and it has been shown that colleague support can contribute to staying in a job rather than quitting (De Clercq et al., 2020).

It can be concluded that humor is a promising intervention in the context of health care.

Limitations and Future Research

There are some limitations in this study that we would like to discuss. First of all, our study included one cohort of nurses in training from two nursing schools. While all nurses of the cohort were included in the study, our sample was still relatively small, which has implications for the power of statistical analyses and the probability of finding significant effects (Bühner & Ziegler, 2009; Neyman & Pearson, 1933). In order to detect relationships and differences of a still reasonable effect size (i.e., to reduce the probability of the type II error), we decided to not apply Bonferroni correction. This implies a higher risk that the null hypothesis is rejected although it is true. At the same time, findings regarding positive effects on work experience were very consistent for the different constructs, so we are optimistic that our findings will be replicable in larger samples. Furthermore, when comparing the intervention group and the control group, it is noticeable that the control group was smaller than the intervention group. Of course, equal sample sizes would have been desirable. Unfortunately, the cohort in the nursing school, which served as control condition, was slightly smaller than the intervention cohort. Still, we consider the findings as first evidence for the effectiveness of a humor intervention for nurses in training. Future studies should add upon our initial results and aim at a larger sample size at best in a multicentric study to validate and generalize findings.

Another potential limitation of our study is that the possibility of randomization was limited. Students of one school were automatically assigned to the intervention group, students from the other school to the control group. This was necessary for several reasons: first, students are based in fixed classes, doing their training together. This means that from an organizational viewpoint, it would have been difficult to separate classmates. Second, even if classmates would have been separated, it is likely that students would have discussed their learnings with their classmates, which could have affected the results (crossover-effects). Therefore, we decided to separate students by school. Having baseline measures of both schools, we consider this a minor problem. Still, future investigations that apply a multicentric approach will be able to overcome this potential limitation.

Furthermore, we see potential for the improvement of our intervention: while the intervention group was given a “homework” exercise for the practice phase, we believe that a refresher session within the 6 months between the first and second measurement would increase the effects. This could also be done with a mobile app, reminding the participants of the contents of the intervention and providing small refresher tasks.

Finally, we want to address the statistical analyses conducted in this study: We have reported

separate mediation models instead of one holistic model. This could be done using structural expiation modelling. Again, a larger sample size would be necessary for such an endeavor.

Another potential future line of research is the link between humor and stress. There is as yet very little research in this area and the mechanisms of how humor reduces stress are not yet well understood. One potential mechanism could be the concept of flow (Bartzik & Peifer, in revision). Flow was found to occur when a stress-relevant situation is re-interpreted as a pleasant challenge (Csikszentmihalyi, 1990). Humor could act as a resource that helps to re-interpret an undesirable situation into a more favorable one, i.e., it could help reaching flow in stress-relevant situations (Bartzik & Peifer, in revision.; Peifer & Tan, 2021). Future research should further explore this and other potential mechanisms explaining the link between humor and stress.

References - Chapter 4

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Supplementary Material Chapter 4

Chapter 4: Care for Joy: Evaluation of a Humor Intervention and Its Effects on Stress, Flow Experience, Work Enjoyment, and Meaningfulness of Work

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TABLE S4.1 | Flow Frequency Scale (Bartzik and Peifer, in preparation).

Instruction	
Below you will find a number of questions **about your daily work**. Please rate "how often" or "rarely" you have had the experience in the **last two weeks**. **How often have you experienced in the last two weeks at work, that …**	
English items	**German items**
1. … you had clear goals in mind.	1. … Sie klare Ziele vor Augen hatten.
2. … you received the right amount of feedback.	2. … Sie das richtige Maß an Feedback erhielten.
3. … you were optimally challenged.	3. … Sie optimal gefordert wurden.
4. … you were completely focused on what you were doing.	4. … Sie vollständig auf Ihr Tun konzentriert waren.
5. … your actions were fluent and smooth.	5. … Ihr Tun flüssig und glatt verlief.
6. … one step automatically resulted in the next.	6. … ein Schritt ganz automatisch den nächsten ergab.
7. … you had everything under control.	7. … Sie alles unter Kontrolle hatten.
8. … you were surprised how quickly time passed.	8. … Sie überrascht waren, wie schnell die Zeit verging.
9. … you were completely absorbed in an activity.	9. … Sie ganz in einer Tätigkeit aufgingen.
10. … you became one with an activity.	10. … Sie mit einer Tätigkeit eins geworden sind.
11. … you "merged" with an activity.	11. … Sie mit einer Tätigkeit „verschmolzen" sind.
Scale	
(1) = "*Never"*, (2) = "*Almost never"*, (3) = "*Sometimes"*, (4) = "*Often"*, (5) = "*Very Often"*, (6) = "*(Almost) always"*	(1) = „*Nie",* (2) = „Fast nie", (3) = „Manchmal", (4) = „Häufig", (5) = „Sehr häufig", (6) = „*(Fast) immer"*

TABLE S4.2 | Perceived meaningfulness of work (self-created items).

Instruction	
Please mark how strongly you agree with the statements below.	
English items	**German items**
1. My work is meaningful.	1. Meine Arbeit ist sinnvoll.
2. The work I do is important for me.	2. Die Arbeit, die ich tue, ist wichtig für mich.
3. My work fulfils me.	3. Meine Arbeit erfüllt mich.
4. My work is meaningful to others.	4. Meine Arbeit ist bedeutsam für andere.
5. My work is meaningful to society.	5. Meine Arbeit ist bedeutsam für die Gesellschaft.
6. My work is appreciated by patients and relatives.	6. Meine Arbeit wird von den Patienten und Angehörigen wertgeschätzt.
7. My work is appreciated by society.	7. Meine Arbeit wird von der Gesellschaft wertgeschätzt.
Scale	
(1) =”*do not agree*” to (6) = “*fully agree*”	(1) = „*stimme nicht zu*“ bis (6) = „*stimme voll und ganz zu*“

Chapter 5: General Discussion

The "*General Discussion*" chapter summarizes the results of the publications in this thesis in relation to the research question, namely whether humor as a resource can foster flow experience and alleviate stress, reports further findings from the publications in this thesis, integrates these findings into the Humor-Flow Model. At the same time, this chapter will give an overview of the strengths and limitations, suggestions for future research, and the practical implications derived from this thesis.

Summary of the Results

This section summarizes the results from Chapters 2 through 4. A summary is provided for each chapter individually and a brief conclusion of the results is provided at the end of this section.

Chapter 2 "*On the Relationships Between Humour, Stress and Flow Experience—Introducing the Humour-Flow Model*"

Chapter 2 provides a comprehensive literature-based research overview of the relationships between the constructs of humor, flow experience, and stress. Although some studies report no relationship between humor and stress (McGhee, 2010b), many studies have observed a negative relationship between humor and stress (Cann & Collette, 2014; Martin & Lefcourt, 1983; McGhee, 2010a, 2010b, 2016; Mesmer-Magnus et al., 2012; Putz & Breuer, 2017; Savage et al., 2017). The lack of relationships noted between humor and stress can be explained by the fact that there are not only positive forms of humor, but also negative forms. The negative forms of humor are probably not related to lowering stress experience (McGhee, 2010b). The negative forms of humor include aggressive and self-destructive humor (Kuiper, 2016). Often negative humor is also referred as the "*Dark Side of Humor*" (Plester, 2016). Even if relationships between humor and stress are not always observed, humor can still be described as stress-buffering (Martin & Lefcourt, 1983). Not only does humor have relationships with stress, but a negative relationship between flow experience and stress can also be shown (Bartzik et al., 2020). Early in flow research Csikszentmihalyi (1975) described that stress can trigger flow experience and prevent boredom. On the physiological level, studies have shown that flow experience can be facilitated at moderate stress levels and that high levels of stress are a hindrance to the experience of flow (Peifer et al., 2014, 2015).

Coping with stress can be achieved through various coping strategies (Carver et al., 1989). Some examples mentioned by Carver et al. (1989): “Focus on & venting of emotions, Acceptance, Planning, Suppression of competing activities, Active coping, or Seeking social support for emotional reasons”. It has also been reported that stress can be managed through humor (McGhee, 2016; Mesmer-Magnus et al., 2012; Wanzer et al., 2005) and flow experience (Donner & Csikszentmihalyi, 1992; Lazarus et al., 1980; Peifer, 2012; Peifer & Tan, 2021).

Humor increases positive emotions and therefore leads to coping because positive emotions and the experience of stress are incompatible. Experiencing positive emotions could help promote coping behaviors (McGhee, 2010b). An increase in positive emotions and positive affect through humor has been reported in several studies (Cann & Collette, 2014; Robert & Wilbanks, 2012; Szabo, 2003). In the comparison of low vs. high humor values, it was shown that high humor helps to perceive stress less and at the same time it shows that humor is related to problem-focused and emotion-focused coping strategies. Humor was shown to help reappraisal of a stressful situation by viewing the situation as an opportunity for personal growth and actively distancing oneself from the stressful situation (Abel, 2002). In the health professions, nurses used humor as a cognitive strategy to cope with stress (Sun et al., 2020; Warner, 1991). Like humor, flow can be considered to be a cognitive coping strategy (Weimar, 2005).

Finally, Chapter 2 derives a *Humor-Flow Model* from the *Transactional Stress and Flow Model* (Peifer, 2012; Peifer & Tan, 2021), which uses humor as a resource to cope with stress and to foster the experience of flow. The Humor-Flow Model describes two pathways (*Pathway 1a* and *Pathway 1b*: Humor promotes positive emotions and thus changes stress coping and *Pathway 2*: Humor directly increases the likelihood of flow experience and at the same time flow experience can increase humor). Ultimately, the Humor-Flow Model produces positive outcomes for individuals through (1) humor and through (2) flow experience. At the same time, the Humor-Flow Model shows that experienced stress has negative consequences for individuals and organizations. In turn, the postulated positive outcomes of flow experience and humor for individuals in the Humor-Flow Model also have positive effects for organizations.

Some of the positive consequences of experiencing humor and flow are increased performance (Bartzik et al., 2020; Christandl et al., 2018; Engeser et al., 2005; Mesmer-Magnus et al., 2012), increased positive affect (Fullagar & Kelloway, 2009; Robert & Wilbanks, 2012;), decreased negative affect (Collins et al., 2009; Heintz, 2017), increased well-being (Bartzik et al., 2020; Cann & Collette, 2014; Crawford & Caltabiano, 2011; Peifer et al., 2020; Rivkin et al., 2018),

increased creativity (Eliav et al., 2017; MacDonald et al., 2006), and decreased stress experience (Bartzik et al., 2020; Martin & Lefcourt, 1983; McGhee, 2010a, 2010b).

The chapter "*On the Relationships Between Humour, Stress and Flow Experience—Introducing the Humour-Flow Model*" summarizes the research so far on humor, flow experience, and stress and provides a foundation for future research.

Chapter 3 "*Negative Effects of the COVID-19 Pandemic on Nurses can be Buffered by a Sense of Humor and Appreciation*"

Chapter 3 presented a questionnaire study on nurses during the COVID-19 pandemic. This study showed that the COVID-19 pandemic had negative effects on flow experience and perceived stress. The COVID-19 pandemic is an extraordinary situation that spanned the globe and caused many deaths (World Health Organization, 2020). Nurses were already emotionally affected during the *Severe Acute Respiratory Syndrome (SARS)* outbreak in 2003 (Chan & Chan, 2004) and high stress levels were also reported during the COVID-19 pandemic (Umucu & Lee, 2020). During the COVID-19 pandemic, nurses were already using humor as a coping strategy (Sun et al., 2020).

We hypothesized that the COVID-19 pandemic would increase perceived stress and decrease the frequency of flow experience. Furthermore, we hypothesized that a sense of humor may buffer the negative effects of the COVID-19 pandemic on perceived stress and the frequency of flow experience. The hypotheses in this study that perceived stress increases, frequency of flow experience decreases, and humor buffers against the negative effects of the COVID-19 pandemic were confirmed. For sense of humor and its subscales, buffering effects could be reported for emotional irritation (conceptualized as stress), emotional exhaustion (conceptualized as stress), and frequency of flow experience. No buffering effects were shown for stress measured with a single item.

The results show the importance of humor for healthcare, as humor was found to have a buffering effect on the negative effects of the COVID-19 pandemic on perceived stress and frequency of flow experience.

Thus, it can be concluded that for the healthcare context, fostering a sense of humor would mean added value. Even though the study was conducted during a particularly extraordinary situation, namely the COVID-19 pandemic, the results can probably be applied to everyday life.

Chapter 4 "*Care for Joy: Evaluation of a Humor Intervention and Its Effects on Stress, Flow Experience, Work Enjoyment, and Meaningfulness of Work*"

Chapter 4 reports on an intervention study conducted with nurses in training. The aim of this study was to show that humor can be trained and further that a humor intervention exerts positive effects on perceived stress (less stress) and frequency of flow experience (more flow). We tested the effectiveness of the humor intervention by comparing sense of humor and its subscales in an intervention group and a control group among nurses in training. At the same time, we used mediation analyses in this study to examine whether the humor intervention exerted an effect mediated by a sense of humor on perceived stress and frequency of flow experience.

As a result, using repeated measures ANOVA, it was observed that in the group as a whole, sense of humor decreased over the time period of six months (Measuring points t_0 to t_1). Furthermore, significant main effects over time were found for the subscales finding humor in everyday life, laughter, and enjoyment of humor. No main effects over time could be reported for the subscales humor under stress, verbal humor, and laughing at yourself. In addition, we examined the interaction effects of time and group over time (Measuring points t_0 to t_1). There was a significant interaction effect for sense of humor. Scores for sense of humor remained stable over time for six months in the intervention group, whereas they decreased over time in the control group. The same significant results were shown for the sense of humor subcomponents: finding humor in everyday life and verbal humor. In contrast, humor under stress, laughing at yourself, laughter, and enjoyment of humor showed no significant interaction effects.

The results of this study show that humor is trainable and that the humor intervention results on humor remained stable over time when compared between an intervention and a control group. Our finding that humor is trainable can be confirmed in the literature (Falkenberg et al., 2013; Hofmann & Giuliani, 2019; Ruch et al., 2018). What makes our humor intervention unique is that it was developed specifically for the nursing profession.

Furthermore, the mediation analyses showed that sense of humor acts as a mediating variable. A mediation between the humor intervention and flow experience mediated by sense of humor was found. The result is consistent with the findings of van Oortmerssen et al. (2020), who reported that more variance in flow experience can be explained when humor is added to a statistical model (the relationship between challenging demands and flow experience during work). Furthermore, studies report a connection between fun and flow experience at work

(Plester et al., 2015; Plester & Hutchison, 2016).

In the mediation hypothesis with stress as an outcome, no significant mediation by humor was found due to the humor intervention, but a significant direct effect of humor on stress was still found (b-path). The negative effect of humor on stress has also been shown in many studies (Bennett, 2003; Canestrari et al., 2021; Martin, 2004; Martin & Lefcourt, 1983; McGhee, 2010a; Sun et al., 2020; Umucu & Lee, 2020; Warner, 1991). One possible reason why the mediation analysis was not significant with perceived stress as the outcome may be the content of the humor intervention tested (Content: The definition of humor, teaching basic humorous communication skills in the context of the nursing profession, positive aspects of the nursing profession were identified, and its relevance to the nursing profession was determined). The topic of stress will be addressed at a later date in the project "Care for Joy" humor intervention series (see also Chapter 4).

Of further interest in this study was the evaluation of the humor intervention. Descriptive evaluations regarding the humor intervention on subjective enjoyment, perceived usefulness, perceived difficulty, subjective knowledge gain, attitude towards training showed that the humor intervention was perceived positively by the participants. Further, using a t-test showed that positive affect significantly increased and negative affect significantly decreased among the participants as a direct result of the humor intervention.

Overall, it can be concluded from the study "*Care for Joy: Evaluation of a Humor Intervention and Its Effects on Stress, Flow Experience, Work Enjoyment, and Meaningfulness of Work*" that humor can be increased in the healthcare sector through a humor intervention and that fostering humor has further positive effects on flow experience. Even though the mediation hypothesis regarding stress could not be confirmed, a negative relationship in the mediation model (b-path) between humor and stress could still be shown. Fostering of humor through the humor intervention was perceived as positive by the participants. The participants reported that they enjoyed taking part in the humor intervention, that it was useful for their everyday work, and that it was easily understandable. Furthermore, they reported an increase in knowledge as a result of the humor intervention.

Humor in the work context can be trained and teaching the use of humor has further positive effects on work-relevant constructs. Humor not only increases the frequency of the flow experience but can also reduce perceived stress.

Summary of Chapters 2 to 4

Humor has been little studied in the work context (Robert, 2017). So far few studies have explored humor and flow experience in the work context (Plester et al., 2015; Plester & Hutchison, 2016; van Oortmerssen et al., 2020).

The results of this thesis show that humor can be a resource in the healthcare context with the potential to facilitate flow experience and reduce stress. Furthermore, humor is trainable and can be promoted through targeted humor interventions. At the same time, promoting humor through a humor intervention has positive effects on the frequency of the flow experience.

In summary, humor as a resource is an important component of nurses' work context with the potential to facilitate flow experience and alleviate stress.

Further Results of this Thesis

In addition to humor, flow experience, and stress, other work-related constructs were examined in the publications reported in Chapters 3 and 4. The results of the studies are briefly presented in this section. The constructs that are mentioned in the following are: *Perceived appreciation (from patients / from society), satisfaction with life, satisfaction with work, satisfaction with work performance, satisfaction with well-being, work enjoyment, and perceived meaningfulness of work.*

In Chapter 3, "*Negative Effects of the COVID-19 Pandemic on Nurses can be Buffered by a Sense of Humor and Appreciation*," appreciation was examined as a buffering resource in addition to humor. Moreover, the effects of the COVID-19 pandemic on appreciation from society, appreciation from patients, satisfaction with life, satisfaction with work, satisfaction with work performance, and satisfaction with well-being were reported.

Appreciation is defined as "… acknowledging the value and meaning of something—an event, a person, a behavior, an object—and feeling a positive emotional connection to it." (Adler & Fagley, 2005, p. 81). In this study, we considered perceived appreciation from the perspective of: (1) appreciation from society and (2) appreciation from patients. This study hypothesized that appreciation may buffer against the negative effects of the COVID-19 pandemic. Other hypotheses in this study were that the COVID-19 pandemic would decrease nurses' satisfaction with life, satisfaction with work, satisfaction with work performance, satisfaction with well-being and that, among nurses, perceived appreciation from society and appreciation from

patients would increase.

Most of the hypotheses could be confirmed. Due to the COVID-19 pandemic, satisfaction with life, satisfaction with work, satisfaction with work performance, and satisfaction with well-being among nurses decreased. Furthermore, the hypothesis that perceived appreciation from society increased due to the COVID-19 pandemic could be confirmed. The hypothesis regarding patients' appreciation could not be confirmed, as this decreased significantly during the COVID-19 pandemic and did not increase as hypothesized. The study reported in Chapter 3 was able to show that appreciation had a buffering effect. Patient appreciation reduced stress (emotional exhaustion), increased frequency of flow experience, satisfaction with work, and satisfaction with work performance. Appreciation from society, on the other hand, had a positive effect only on the frequency of flow experience. No buffering effect of appreciation was observed for satisfaction with life and satisfaction with well-being.

From the further results of the study "Negative effects of the COVID-19 pandemic on nurses can be buffered by a sense of humor and appreciation" it can be concluded that appreciation can also be an important resource in the context of nurses' work. Appreciation from society and patients seem to be important constructs that can facilitate flow experience. In addition, appreciation from patients may contribute to reducing nurses' stress.

In Chapter 4 "*Care for Joy: Evaluation of a Humor Intervention and Its Effects on Stress, Flow Experience, Work Enjoyment, and Meaningfulness of Work*" additionally examined whether humor mediates the relationship between the humor intervention and work enjoyment as well as perceived meaningfulness of work. The hypotheses that humor mediates the relationship between the humor intervention and work enjoyment as well as perceived meaningfulness of work as outcomes could be confirmed.

The mediation analysis based on the humor intervention and work enjoyment as outcome showed a positive effect mediated by sense of humor. This result confirms earlier research on humor and similar constructs, such as positive affect (Cann & Collette, 2014; Martínez-Martí & Ruch, 2014; Robert & Wilbanks, 2012; Szabo, 2003), well-being (Cann & Collette, 2014; Crawford & Caltabiano, 2011; Jiang et al., 2020; Proyer et al., 2010), and job satisfaction (Mesmer-Magnus et al., 2012; Robert & Da Motta Veiga, 2017).

On the research question of whether a humor intervention increases sense of humor and has positive effects on perceived meaningfulness of work through sense of humor, there had been to the best of our knowledge no research prior to our study. Derived from the definition of

humor by Peterson and Seligman (2004) as a character strength, we made the link to increasing perceived meaningfulness of work through sense of humor. It was found that sense of humor mediates the effects of the humor intervention on perceived meaningfulness of work. The result represents a preliminary indication of possible associations between sense of humor and perceived meaningfulness of work. It can be assumed that fostering a sense of humor can also increase perceived meaningfulness of work at the same time. Perceived meaningfulness of work shows positive correlations with organizational commitment, job satisfaction, intrinsic motivation, and life satisfaction. Furthermore, negative correlations can be reported between perceived meaningfulness of work and depression, hostility, anxiety, and days absent from work (Steger et al., 2012). The described relationships of perceived meaningfulness of work show the relevance for the healthcare context and thus an increase through humor is an added value for the work context.

In this section, the results of the publications that were not part of the research aim of this thesis were reported. Nevertheless, the results from the publications in Chapters 3 and 4 should be reported, as they can enhance the Humor-Flow Model addressed in Chapter 2.

The Humor-Flow Model

Chapter 2 presented the "Humor-Flow Model," which suggests that humor as a resource facilitates flow experience, reduces stress, and has positive outcomes for individuals and organizations. The results in this thesis support the hypothesis of the Humor-Flow Model and are integrated into the Humor-Flow Model in this section (see **Figure 5.1**). In the next sections, the results of this thesis are applied to the various elements of the Humor-Flow Model in order to (1) confirm the assumptions of the model and (2) extend the model. The results of the studies in Chapters 3 and 4, shown in **Figure 5.1**, can be found in the **Supplementary Material** of Chapter 5 (**Table S5.1** to **Table S5.6**).

Pathways 1a and 1b of the Humor-Flow Model

In the Humor-Flow Model, *pathway 1a* and *pathway 1b* were described in that humor alters the primary appraisal (pathway 1a) and secondary appraisal (pathway 1b) of a stressor through the experience of positive emotions (Cann & Collette, 2014; Robert & Wilbanks, 2012; Szabo, 2003), leading to stress reduction (McGhee, 2010b). The studies of this thesis provided initial evidence for the hypothesis and are summarized below and presented in **Figure 5.1**.

The studies in Chapters 3 and 4 were able to provide some evidence for the theoretical considerations of pathways 1a and 1b in the Humor-Flow Model. Several correlations, a negative effect between humor and stress, and a buffering effect of humor on a stressor could be reported.

Chapter 3 of this thesis examined the negative effects of the COVID-19 pandemic as a stressor on nurses. It was shown in the results that stress increased in comparison before and during the COVID-19 pandemic. Stress was measured with stress as a single item, emotional irritation, and emotional exhaustion. Here, significant changes were shown for stress as a single item, emotional irritation, and emotional exhaustion. For emotional irritation and emotional exhaustion, a buffering effect on the negative effects of the COVID-19 pandemic could be shown by sense of humor (+ its subscales). Additionally, negative correlations between sense of humor and its subscales with stress before and during the COVID-19 pandemic were reported in Chapter 3. Before and during the COVID-19 pandemic, negative correlations were observed between sense of humor (+ its subscales) and emotional irritation as well as emotional exhaustion. For stress measured with a single item no significant correlations with sense of humor or its subscales were observed.

Further evidence for pathway 1a and pathway 1b could be taken from the study "*Care for Joy: Evaluation of a Humor Intervention and Its Effects on Stress, Flow Experience, Work Enjoyment, and Meaningfulness of Work*". In this study, a humor intervention was conducted with nurses in training and its effectiveness was examined in relation to perceived stress. The humor intervention did not affect perceived stress, but a negative effect was observed between sense of humor and perceived stress. In this study, there was a negative effect between sense of humor and perceived stress of (β = -.22) and negative correlations between perceived stress and sense of humor and their subscales (r = -.22 to r = -.33).

The results of this thesis show that humor as a resource can buffer against stress and that there is a negative association between humor and stress. That humor can act as a coping strategy in relation to stressful situations has also been shown in another questionnaire study with healthcare workers. The healthcare workers scoring high on humor showed less stress in the COVID-19 pandemic than did to those reporting lower humor coping scores (Canestrari et al., 2021).

Although the studies reported a negative association between humor and stress and a buffering effect of humor on a stressor, it was not possible to determine on which pathway (1a or 1b) humor acted as a resource.

For a better understanding of humor as a resource and future development of humor interventions, it would be beneficial to know if there are differences between pathways 1a and 1b in the Humor-Flow Model. Furthermore, pathways 1a and 1b could only be partially confirmed in the studies. The assumption was that humor increases positive emotions and thus leads to coping, but the increase of emotions by humor was not controlled for in the studies of this thesis.

Pathway 2 of the Humor-Flow Model

In the Humor-Flow Model, *pathway 2* is supposed to increase the likelihood of a flow experience through humor while successfully coping with stress. The assumption that humor can increase the probability of experiencing flow is based on findings by Plester et al. (2015) and van Oortmerssen et al. (2020). The studies of this thesis provided initial evidence for the hypothesis. These are summarized below and presented in **Figure 5.1**.

In the study from Chapter 3, positive correlations were shown between sense of humor (+ its subscales) and flow experience before and during the COVID-19 pandemic.

Before and during the COVID-19 pandemic, sense of humor (+ its subscales) showed positive correlations with flow experience. Additionally, evidence for pathway 2 in the Humor-Flow Model could be reported from the study in Chapter 4. The study showed a positive effect and also correlations between sense of humor (+ its subscales) and flow experience. The mediation analysis, which examined the effect of a humor intervention on the flow experience via the sense of humor, showed a medium positive effect between sense of humor and flow experience on the b-path. In addition, the study in Chapter 4 also showed correlations between sense of humor (+ its subscales) and flow experience.

It can be confirmed that there is a positive effect between humor and flow experience. The results in this thesis related to pathway 2 are supported by the studies by Plester et al. (2015) and van Oortmerssen et al. (2020).

Ruch and Heintz (2018) suggest that the subscales should also be used when considering sense of humor. With regard to pathway 2, positive correlations were reported for all subscales of sense of humor in this thesis.

For the subscale humor under stress, the highest correlation with flow experience was reported. Humor under stress according to McGhee (2010a) is the ability to keep one's humor even under

stress and thus to work effectively even under stress, because mood can be controlled. Flow experience is facilitated by a moderate stress level, while too high a stress level impedes flow (Peifer et al., 2014, 2015).

Considering the study in Chapter 3 in isolation, the results suggest that the correlation between humor under stress and flow experience was higher during the COVID-19 pandemic, which was described as a stressor, than before the COVID-19 pandemic. It may be that the medium and the high positive correlation of the subscale humor under stress with flow experience can be explained by the fact that humor under stress reduces stress as a coping ability and can thus facilitate flow.

Furthermore, medium correlations between the subscales laughter as well as laughing at yourself and flow experience could be observed, which may also be due to the stress buffering effect of laughter (Akimbekov & Razzaque, 2021; White & Winzelberg, 1992). It can therefore be assumed that high stress levels are also reduced by the subscales laughter and laughing at yourself, thus achieving moderate stress, which in turn fosters flow.

For the subscale enjoyment of humor, only one positive relationship was found in the two studies of this thesis. Interestingly, the positive correlation was only reported in the study in Chapter 3 during the COVID-19 pandemic. Enjoyment of humor according to McGhee (2010a) is the ability to look for humorous situations or humorous things. COVID-19 as a stressor could make nurses look for coping strategies more and humor has already been actively used as a coping strategy during the COVID-19 pandemic (Canestrari et al., 2021). Especially in stressful situations, it could be that the enjoyment of humor becomes relevant as a coping strategy. thereby exerting a positive influence on flow experience.

Considering all the results of the studies in Chapters 3 and 4 regarding pathway 2, the assumptions that humor has a positive effect on flow can be partially confirmed. What could not be confirmed in this thesis was the direction of the effects. Especially because the Humor-Flow Model assumes a reciprocal relationship between humor and flow (see "*Further Predictions of the Humour-Flow Model*" in Chapter 2) the directions of effects should be explored in further studies.

Humor and Positive Outcomes for Individuals

The Humor-Flow Model from the chapter "*On the Relationships Between Humour, Stress and Flow Experience—Introducing the Humour-Flow Model*" assumes that humor as a resource has

direct positive outcomes for individuals. For example, humor has positive relationships with job satisfaction and creativity, and at the same time humor reduces anxiety, depressive symptoms, and negative affect (Eliav et al., 2017; Heintz, 2017; Menéndez-Aller et al., 2020; Mesmer-Magnus et al., 2012). In the following, the results from the studies in this thesis are presented in the form of correlations and positive effects that extend the existing theoretical assumptions.

In the study reported in Chapter 3, further buffering effects by humor on a stressor (the COVID-19 pandemic) and several positive correlates with humor were found. The sense of humor subscales enjoyment of humor and humor under stress buffered against the negative effects of COVID-19 pandemic for satisfaction with work ($\beta = .22$ & $\beta = .25$) and satisfaction with work performance ($\beta = .25$). Furthermore, several correlations between sense of humor (+ its subscales) and satisfaction with work, satisfaction with life, satisfaction with work performance, satisfaction with well-being, appreciation from society, and appreciation from patients were found.

In addition, positive effects from the different mediation models between sense of humor and work enjoyment ($\beta = .36$) and perceived meaningfulness of work ($\beta = .41$) were perceptible in the study referred to in Chapter 4. In addition to the positive effects, positive correlations between sense of humor (+ its subscales) and work enjoyment and perceived meaningfulness of work could also be observed.

In the Humor-Flow Model, the thesis adds the constructs satisfaction with work, satisfaction with life, satisfaction with work performance, satisfaction with well-being, appreciation from society and appreciation from patients, perceived meaningfulness of work, and work enjoyment to the positive outcomes for individuals through humor.

Flow and Positive Outcomes for Individuals

The Humor-Flow Model assumes that flow experience has positive outcomes for individuals. In the model, various flow outcomes, such as well-being, job satisfaction, and performance were presented. The results shown in this thesis for flow experience and satisfaction with work, satisfaction with work performance, and satisfaction with well-being can also be found in earlier studies (Bartzik et al., 2020; Christandl et al., 2018; Maeran & Cangiano, 2013).

A relationship between flow and satisfaction with life was reported in Chapter 3. This relationship has not yet been considered in the Humor-Flow Model, but in a study with top

athletes and elite musicians, flow and all components of flow showed positive relationships with life satisfaction (Habe et al., 2019). The Humor-Flow Model should be expanded in the future to include the outcome for individual "life satisfaction," since life satisfaction is particularly highly correlated with job satisfaction (Judge & Watanabe, 1993). An increase in life satisfaction can thus lead to a simultaneous increase in job satisfaction (Judge & Watanabe, 1993). A study with primary care providers resulted in a negative effect of job satisfaction on turnover intentions (Wang et al., 2020).

Chapter 3 reported a positive relationship between flow and appreciation from society / from patients. To the best of my knowledge, there has been no previous research on flow and appreciation. One concept associated with flow is feedback (Csikszentmihalyi, 1975, 1990). In a study with soccer players it was found that the higher the flow experience of the players, the better the performance feedback from the coach (Bakker et al., 2011). In addition, another study reported that highly conscientious participants had higher flow scores when they received positive feedback (Hohnemann et al., online first / 2022). Earlier research has reported a direct effect of feedback from the job on flow experience (Maeran & Cangiano, 2013) as well as an indirect effect of positive feedback mediated by specific self-efficacy on flow experience (Peifer et al., 2020). Given the findings on flow and appreciation in this contribution and considering the results of studies on flow and feedback, this relationship should be included in the Humor-Flow Model and considered as a starting point for further research.

Positive correlations between flow and work enjoyment as well as perceived meaningfulness of work can be found in the study in Chapter 4. Work enjoyment in Chapter 4 was described as a form of the extent to which individuals find their work intrinsically pleasurable. Considering the three core components of the flow model by Peifer and Engeser (2021), one core component is "Enjoyment", which is also used by Bakker (2005) for his conceptualization of flow as a component. Greater work enjoyment could cause employees to want to continue in their jobs because they enjoy working. Work enjoyment can also be considered a part of job satisfaction (MOAQ; Cook et al., 1981). Individuals may experience higher job satisfaction and therefore be less likely to quit their job because low job satisfaction is more likely to lead to turnover intentions (Wang et al., 2020).

Thus, increasing enjoyment at work by experiencing flow could have positive effects for individuals and organizations. The results from Chapter 4 add the construct of work enjoyment as an outcome for individuals to the Humor-Flow Model.

Chapter 4 reported a positive correlation between flow experience and perceived meaningfulness of work. The research on the relationship between flow experience and perceived meaningfulness of work is limited. Apart from the study from Chapter 4, to the best of my knowledge the only study is that by Maeran and Cangiano (2013) with 105 participants, which reported a high positive relationship between flow and meaningfulness of work. This study also showed that flow and meaningfulness of work are predictors of job satisfaction, with experiencing flow being a better predictor than meaningfulness of work (Maeran & Cangiano, 2013). Considering the result in this thesis that flow experience and perceived meaningfulness of work are positively related to each other, it can be assumed that this may also have an impact on job satisfaction, which in turn may prevent employees from forming intentions to quit. However, in the study in Chapter 4, the direction of the effect between flow experience and perceived meaningfulness of work could not be determined. Thus, it is also possible that perceived meaningfulness of work affects flow experience and thus is not an outcome of flow experience in the Humor-Flow Model. This could mean that perceived meaningfulness of work could facilitate flow experience. Therefore, it is even more important that employees experience meaningfulness of work, already part of the *Job Characteristics Model* by Hackman and Oldham (1976), in order to promote intrinsic motivation, improve work performance and prevent fluctuations.

The results of this thesis confirmed the assumptions of the Humor-Flow Model that flow has positive associations with well-being, life satisfaction, work satisfaction, and work performance. Furthermore, new findings regarding the positive relationship between flow and perceived appreciation (from society and patients) and also perceived meaningfulness of work were reported. However, because these are correlative results, no causality can be assumed. In particular, perceived appreciation and perceived meaningfulness of work could be factors conducive to flow experience. Therefore, further research on flow experience, perceived appreciation, and perceived meaningfulness of work should be conducted in the future.

Stress and Negative Outcomes for Individuals

Stress in the Humor-Flow Model should report negative outcomes for individuals. It has been suggested that stress has negative effects on well-being (Estryn-Behar et al., 1990; TK, 2016).

The thesis was able to show negative correlations of stress with satisfaction with work, satisfaction with life, satisfaction with work performance, satisfaction with well-being,

appreciation from society, appreciation from patients, work enjoyment, and perceived meaningfulness of work. The reported correlations added to the model new results that could be negatively affected by stress. Nevertheless, the directions of effects cannot be predicted on the basis of the correlations.

The negative correlation in this thesis between stress and satisfaction with well-being could be an indication of the presumed negative effect of stress on well-being in the Humor-Flow Model. In addition to well-being, the reported negative relationship between stress and life satisfaction has also been supported in other research. A study in which 301 student nurses completed an online questionnaire showed that stress is associated with low life satisfaction and low well-being (Labrague, 2021).

Chapter 3 reported a negative relationship between stress and satisfaction with work performance. Experienced stress can result in a higher likelihood of musculoskeletal disorders (Soteriades et al., 2019) and musculoskeletal disorders in combination with long-term stress result in lower work performance (Lindegård et al., 2014). Furthermore, a negative association between a stressor (the COVID-19 pandemic) and work performance was reported in a study during the COVID-19 pandemic (Sadovyy et al., 2021).

The literature on the relationship between appreciation and stress may support the negative correlation reported in this thesis. Appreciation for others shows a negative relationship with depressive symptoms (Deichert et al., 2019). Furthermore, Deichert et al. (2019) showed in their study that appreciation for others as a moderator has a stress-buffering effect regarding depressive symptoms. Participants with highly stressful life events had more severe depressive symptoms, but participants with higher appreciation for others had significantly fewer symptoms than did participants low in appreciation. In addition, participants with less appreciation for others were found to have significantly more severe physical symptoms. In another study, 2,640 participants reported that low appreciation from a superior was a predictor of depressive symptoms (Pohrt et al., 2021).

In a study by Elstad and Vabø (2021) with a total of 3,677 eldercare workers, it was found that one-third of eldercare workers do not feel valued by top municipal leaders and one-fourth by the mass media. That study moreover showed that over 41.1% of respondents had considered quitting the profession in the last 12 months. It also showed in the results that lack of recognition from society can influence turnover intentions (Elstad & Vabø, 2021).

This thesis also reported negative correlations between perceived meaningfulness of work and perceived stress in Chapter 4. The negative relationship found is supported by the study by Minkkinen et al. (2020), in which the authors found in a study on teachers that perceived meaningfulness of work can act as a protective factor against work stressors. As in the study referred to in Chapter 3, another study found small negative correlations between various meaningful work components (positive meaning, meaning-making, and greater good motivations) and work stress (Allan et al., 2016).

In the Humor-Flow Model it was assumed that stress has a negative impact on individuals' well-being. This assumption was confirmed in this thesis and the model could also be extended by showing negative links between stress and work-relevant constructs.

Studies show that the nursing profession is described as particularly stressful with many demands that can lead to burnout among nurses (Khamisa et al., 2015, 2017; Lindegård et al., 2014; Schmitz et al., 2000; Simon et al., 2005). Stress may be one reason nurses want to quit their jobs (Chiang & Chang, 2012; Choi & Kim, 2020).

The findings in this section highlight the importance of successfully managing stress at work. Due to nurses' high stress levels, it is even more important for them to find a way to successfully cope with stress. Here, as described in the Humor-Flow Model, humor as a resource could be an important component in the profession of nursing to cope with stress.

Positive Outcomes for Organizations

Flow and humor have positive effects and stress has negative effects on the organizational level. Flow experience and the use of humor in the Humor-Flow Model have a positive effect on reducing absenteeism and staff turnover, increased organizational commitment, organizational productivity, and increased job satisfaction. On the organizational level, stress leads to higher absenteeism, intention to quit and staff turnover (see Chapter 2).

This thesis reported positive links between flow experience and satisfaction with work and satisfaction with work performance. In addition, humor was shown to buffer against the negative effects of stressors on satisfaction with work and satisfaction with work performance. Thus, evidence could be shown for the assumption in the Humor-Flow Model that flow and humor influence work satisfaction and work performance.

Nevertheless, the outcomes have been reported from the perspective of the organization's

employees and organizational assessment is lacking. Thus, for the outcomes at the organizational level, further data would need to be collected, including the organizations' assessment. Because this thesis only considered the employee perspective, **Figure 5.1** combines the positive outcomes for individuals and organizations. For further research, the individual vs. organizational positive outcomes could be examined separately, as suggested in Chapter 2.

Summary of the Section "The Humor-Flow Model"

Chapter 2 of this thesis, which introduced the Humor-Flow Model, is a theoretical publication relating earlier study findings on flow, humor, and stress. The Transactional Model of Stress and Flow (Peifer, 2012; Peifer & Tan, 2021) was used to develop the Humor-Flow Model by using humor as a resource to facilitate flow.

It was shown in the studies discussed in Chapters 3 and 4 that the assumptions in the Humor-Flow Model (Chapter 2) found support and at the same time, from further results in the studies, that the model could be extended. In this thesis the hypotheses that humor is positively linked to flow experience and negatively linked to stress and also that humor and flow have positive outcomes for individuals were confirmed. As hypothesized in the Humor-Flow Model, stress proved to have negative relationships with positive outcomes for individuals.

In this thesis, in addition to flow experience, humor, and stress, the psychological constructs of perceived appreciation (from patients / from society), satisfaction with life, satisfaction with work, satisfaction with work performance, satisfaction with well-being, work enjoyment, and perceived meaningfulness of work were examined using the Humor-Flow Model.

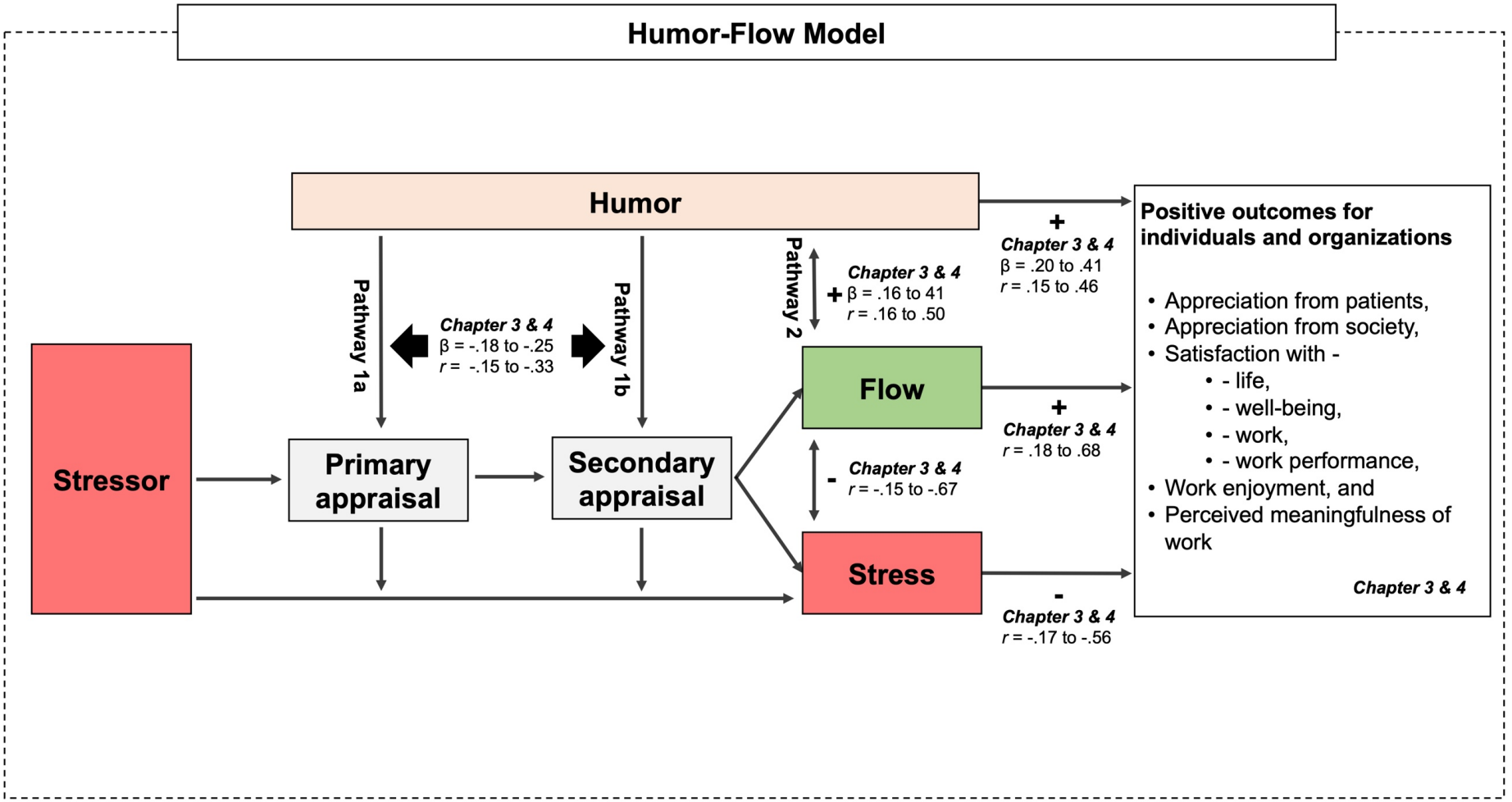

FIGURE 5.1 | The Humor-Flow Model from Chapter 2 according to the results of the studies from Chapters 3 and 4.

Strengths of this Thesis

Several strengths can be identified in this thesis and discussed below.

So far very few studies have been presented on the facilitation of flow experience in the work context through humor as a resource. A strength of this thesis is that in Chapters 1 through 4 it summarizes the small amount of research accomplished and adds new findings to the research in Chapters 2 through 4. This work can be seen as a foundation for further research in the area of flow and humor as well as stress.

Another strength of this work is that two of the three publications were conducted in the healthcare context. The nursing profession is considered to be particularly system-relevant with especially stressful conditions that result in early job exit (Hasselhorn et al., 2003; Simon et al., 2005). The results of this work could help to counteract early job exit by increasing humor and flow and reducing stress.

In this thesis, the mixture of theoretical and practice-oriented research can be considered a strength.

Chapter 2 "*On the Relationships Between Humour, Stress and Flow Experience—Introducing the Humour-Flow Model*" is a literature-based chapter that presents the relationships between humor, flow experience, and stress. In addition, Chapter 2 derives a "Humor-Flow Model" from the literature, which considers humor as a resource in dealing with stress and that humor can facilitate the experience of flow. It can be positively emphasized that the Humor-Flow Model constitutes a foundation for further research.

Chapter 3 "*Negative Effects of the COVID-19 Pandemic on Nurses can be Buffered by a Sense of Humor and Appreciation*" was a questionnaire study conducted in the healthcare context at a particularly extraordinary time.

The results are particularly interesting because the COVID-19 pandemic had an impact on the entire global situation and the results of the study can contribute to an improvement in working conditions in the field of nursing. The results from the extraordinary situation can probably be applied to the everyday situation in nursing. It should be especially emphasized that the COVID-19 pandemic was not predictable and plannable and therefore a questionnaire study was developed in a very short time to enable a comparison of the participants' experiences of humor and flow experience as well as other work-related constructs (satisfaction, appreciation from patients and from society, and stress) before and during the COVID-19 pandemic. This

study provides some practical advice on how to improve the future healthcare work environment.

In Chapter 4 "*Care for Joy: Evaluation of a Humor Intervention and Its Effects on Stress, Flow Experience, Work Enjoyment, and Meaningfulness of Work*" a humor intervention was conducted and evaluated among nurses in training.

One strength that can be derived from the publication reported in Chapter 4 is the conducting of an intervention study with an intervention group and a control group. A particular strength of this study was that we were able to examine two nursing schools with the same training curriculum. The nursing schools are operated by the same nursing service provider. A positive aspect is the long geographical distance between the nursing schools of the intervention group and control group (the cities of Münster and Berlin in Germany), so that the contents of the humor intervention could not be communicated to the nursing students. The results are particularly relevant for practice and provide a basis for optimizing training in the nursing profession.

Limitations of this Thesis

This thesis has limitations in Chapters 2 to 4 which should be conceded for the sake of completeness.

Chapter 2 "*On the Relationships Between Humor, Stress and Flow Experience—Introducing the Humor-Flow Model*" introduces the Humor-Flow Model, which was derived from the previous theory on humor, flow experience, and stress theory. Until the results of this thesis, Chapters 3 and 4 of this thesis became available, the evidence of the validity of the model could not be confirmed. Chapter 2 also lacked literature on flow, humor, and stress in the health context.

Chapter 3 "*Negative Effects of the COVID-19 Pandemic on Nurses can be Buffered by a Sense of Humor and Appreciation*" is a questionnaire study asking participants to recall a time before the COVID-19 pandemic. The very fact that participants were asked to recall a time before a particularly stressful period may have led to bias. Furthermore, the study was conducted during a period (July 2020) when the incidence of infection was lower than before the study was conducted.

The size of the sample in Chapter 4 "*Care for Joy: Evaluation of a Humor Intervention and Its*

Effects on Stress, Flow Experience, Work Enjoyment, and Meaningfulness of Work" is very small. The sample size in the control group in particular should have been larger to interpret the comparison between intervention and control groups. In addition, the hypotheses in this study were tested separately from each other and no holistic model was used. At the same time, Bonferroni corrections were not applied in the calculation due to the small sample size. Another limitation in Chapter 4 is that the control group only completed a questionnaire and did not receive a placebo intervention. A placebo intervention would have been beneficial for the study design but for economic reasons was not feasible.

There was a lack of reinforcement sessions to increase the impact on the intervention group that could have consolidated what was learned.

Future Research

The various studies in this thesis are intended to help extend the research on flow and humor in the work context. In the field of flow, there is already a lot of literature focusing on flow experience in the work context (e.g., Fullagar & Delle Fave, 2017; Fullagar & Kelloway, 2009; Ilies et al., 2017; Peifer & Wolters, 2017, 2021). However, there is so far little literature on fostering flow experience in the work context through humor (Bakker & van Woerkom, 2017; Plester et al., 2015; Plester & Hutchison, 2016; van Oortmerssen et al., 2020).

Through the new findings in this thesis, a foundation has been laid to proceed to further research on fostering flow through humor. Several research opportunities for the future are recommended below.

In Chapter 2, the Humor-Flow Model was derived from flow, humor, and stress theory and introduced. Future research should empirically investigate the different pathways of the Humor-Flow Model (*Pathway 1a*: humor as a resource in the primary appraisal, *pathway 1b*: humor as a resource in the secondary appraisal, and *pathway 2*: flow and humor have a reciprocal relationship).

Several research questions can be developed from consideration of pathways 1a, 1b, and 2 in the Humor-Flow Model.

In this thesis, the positive emotions elicited by humor were not included in pathways 1a and 1b. Future research should therefore control for positive emotions in pathways 1a and 1b to determine whether humor, as hypothesized, enhances positive emotions (Cann & Collette,

2014; Robert & Wilbanks, 2012; Szabo, 2003) and can thus reduce stress. A qualitative approach (e.g., diary study) and a quantitative approach (e.g., a mediation model with humor as the independent variable, positive emotions as the mediator, and stress as the dependent variable) could be used to control for the hypothesis. A long-term study with multiple measurement time points would be beneficial here.

Future research could investigate whether there are differences in the effects of humor in pathways 1a and 1b. To investigate the distinction between pathways 1a and 1b, a qualitative study could be conducted with nurses. Furthermore, in future an investigation could be carried out on whether and how the four different humor styles proposed by Martin et al. (2003) influence pathways 1a and 1b and which humor styles have an effect on pathways 1a and 1b in the Humor-Flow Model and can foster flow experience.

Pathway 2 assumes a reciprocal positive effect between flow experience and humor. The positive link between flow and humor was shown in this thesis, but the direction of effect could not be confirmed. Future research should therefore test the hypothesis of the reciprocal relationship of flow and humor. To test the hypotheses, a long-term intervention study with three groups (two intervention groups and one control group) should be conducted. One intervention group would receive humor interventions first and flow interventions halfway through the study, while the second intervention group would receive flow interventions first and humor interventions second. The control group would receive no intervention during the study and only complete questionnaires at the same time points as the intervention groups. The control group should still receive the humor and flow interventions at the end of the study.

In addition, the Humor-Flow Model described positive effects of flow and humor as well as negative effects of stress for individuals.

In this thesis the first hypotheses about the positive effects of flow and humor as well as the negative effects of stress were confirmed. In the section “Humor-Flow Model” in this chapter, further positive effects of flow and humor and negative effects of stress on the positive outcomes of individuals were reported (e.g., perceived appreciation and perceived meaningfulness of work). The results should be replicated in further studies, as in this thesis the direction of effect of perceived esteem and perceived meaningfulness of work could not be confirmed.

The positive outcomes of individuals mediated by flow experience and humor are also conducive to positive outcomes for organizations. For empirical testing of the Humor-Flow

Model, a longitudinal study should be conducted in different organizations. By collecting data at several measurement points in a longitudinal study, it would be possible to conduct a multilevel analysis. The Humor-Flow Model can be statistically tested as a holistic model using a structural equation model.

If the Humor-Flow Model is tested in a longitudinal study, it will provide an opportunity to integrate other resources for fostering flow experience into a holistic model. In Chapter 3, appreciation was examined as a protective factor, and it was observed that appreciation can buffer against the negative effects of extraordinary circumstances. According to the results of the study in Chapter 3, the question is whether appreciation has not only a buffering effect in an extraordinary situation but also directly has a facilitating effect on flow experience. Appreciation is positively related to positive affect (Fagley, 2018) and could operate through the same pathways as humor in the Humor-Flow Model. The research question regarding the facilitation of flow experience through appreciation is particularly relevant to leadership research.

For future research, the perceived meaningfulness of work could also be examined as a resource, likewise the directions of effects on flow and humor. A long-term study could be conducted for this purpose, as already suggested. It would be particularly interesting to examine the directions of the effect of perceived meaningfulness of work. In the study reported in Chapter 4 of this thesis, we hypothesized that humor affects perceived meaningfulness of work. According to Peterson and Seligman (2004), humor as a character strength is a component of transcendence that generates meaning in individuals. However, earlier research on flow and relevance may indicate that meaningfulness of work affects flow. Engeser and Rheinberg (2008) showed that the perceived importance of the task as a moderator influences the relationship between the balance of task difficulty and skills and flow experience. Future research should investigate the relationships between humor, flow, and perceived meaningfulness of work in more detail and replicate the findings presented in this thesis.

Another interesting research possibility would be to examine the extent to which playful work designs influence the experience of flow. Humor is considered a playful attitude (McGhee, 2010a) and humor fosters flow, thus a playful work environment can further foster flow. Bakker and van Woerkom (2017) reported that a playful work design can increase the probability of experiencing flow. A playful work design could be based on the elements of gamification, for example. Some commonly applied gamification elements include achievements, challenges, synchronizing with the group, transparent display of results, countdowns, processing speed, or

even luck (Dale, 2014). Gamification increases employees' motivation and productivity, goals and expectations of employees are aligned with those of the organization (Dale, 2014). For future research, it would be possible to develop an intervention that empowers employees to integrate elements of gamification into their daily work. An example of a gamification action would be creating a to-do list and working through the tasks to be done with a countdown (Bakker & van Woerkom, 2017). The effect of the intervention and the individual gamification elements on humor and flow can be tested in a long-term study, e.g., in a multilevel analysis.

Another way to foster humor as a resource in the healthcare context and thus facilitate the experience of flow would be the use of individual coaching on the topics of humor, establishing a playful attitude at work, and flow. The advantage of individual coaching is the opportunity to apply a person-centered approach, e.g., according to Carl Rogers (Rogers, 2004; Rogers & Farson, 2015), which considers the individual strengths, weaknesses and needs of the coachee with positive appreciation and thus stimulates personal growth and learning. Jones et al. (2016) showed that coaching has positive effects on affective outcomes (e.g., well-being), skill-based outcomes (e.g., technical skills), and individual-level outcomes (e.g., productivity). Furthermore, a meta-analysis showed that coaching has positive effects on coping with present and future stressors at work (Theeboom et al., 2014). The category of coping was described in the study by Theeboom et al. (2014) with the constructs self-efficacy and mindfulness as examples. Humor is also considered a coping strategy (Tan & Schneider, 2009) and therefore it may be interesting for future research to explore the effects of individual coaching in healthcare with a focus on humor.

In this thesis, the studies reported in Chapters 3 and 4 were conducted in the nursing context. Future research could investigate whether the resource of humor also acts as a protective factor in other organizations than the healthcare sector and whether the humor intervention from Chapter 4 also has positive effects outside the healthcare sector in the work context.

Briefly summarized, future research should focus on the empirical investigation of the Humor-Flow Model, expansion of resources to foster flow experience, transferability of humor interventions from the healthcare sector to other work contexts, and design of humorous, fun-oriented work environments and activities.

Practical Implications

This thesis was especially concerned with the working context of the nursing profession; therefore, the practical implications refer primarily to this field. Moreover, transferability to other professional contexts will be presented in the practical implications.

The results of this thesis show that humor as a resource has positive effects in the work context and can facilitate flow experiences and reduce stress. However, the use of humor in the context of care is still viewed critically, even though initial positive successes have been evaluated, particularly in the field of child care through the use of clinic clowns (Leufgen, 2014).

In order to increase the acceptance of humor as a resource and flow experience in the nursing context, it seems to be of great importance to provide information about the psychological constructs of humor and flow experience in the work context. Such information should relate to what humor is as a resource and what flow in the healthcare context can do achieve for the individual and the organization (e.g., improve work performance, work satisfaction, and well-being and decrease experiences of stress). Leufgen (2014) identifies a lack of economic arguments for the use of humor in a medical context and this aspect should definitely be considered in information dissemination. For example, it is also relevant for organizations if their employees have good well-being, because this has a positive impact on economic profitability (Raya & Panneerselvam, 2013) and leads to better performance and less staff turnover (Fritz et al., 2010).

To reduce stress among medical employees and simultaneously facilitate the experience of flow, humor training should be offered regularly to medical employees. An important success factor for humor training is that it is conducted on a voluntary basis. Through humor training, medical employees can learn what humor is in the work context as opposed to everyday language use, how and when humor can be applied, what positive effects humor has, and what limitations it may have.

In the medical context, not only humor should be trained; so also should other strategies that can facilitate the experience of flow. For this purpose, flow training could be developed specifically for the healthcare context. There is already a systematic review on cognitive flow and healthcare that also suggests the integration of flow training into the work context (McQueen et al., 2021). The goal of this flow training should be for nurses to use strategies to foster flow experience as frequently as possible within their framework at work. Since the nursing profession is particularly stressful, special emphasis should be placed on the balance

between tension and relaxation. The dynamic alternation of tension and relaxation in particular seems to be very helpful for experiencing flow (Baumann et al., 2016).

As described in the study in Chapter 4, the promotion of humor can already be introduced in professional training. The advantage of early integration is that strategies can be learned and applied early in professional life to cope with the demands of the particularly stressful profession of nursing. When humor training is integrated into the training curriculum, there is an opportunity for it to be integrated as an important coping strategy in the medical context as a part of a nursing culture. Only when the benefits of humor are recognized and acknowledged by many nurses can a large-scale and beneficial humor-nursing culture develop.

However, not only can humor be trained early in the training program, it also offers an opportunity early in the training program process for nurses to learn strategies to experience flow more frequently and to avoid the risk of stress and burnout. Here, too, is an opportunity for experiencing flow to increase job satisfaction and work enjoyment and protect against increased staff turnover. A retention strategy for employees is particularly relevant, because many nurses are already leaving the profession early and there is likely to be a shortage of professionals due to demographic change, which could become more acute in the future (Bundesagentur für Arbeit, 2017, 2018, 2020; Hornung, 2013).

The use of humor and the fostering of flow experiences should not be limited to the nursing context. High levels of stress are reported by workers in many other professions, among them the professions of police officers, firefighters, teachers, bankers, research assistants, and office workers (Giorgi et al., 2017; Johnson et al., 2005; Ryan et al., 2017; Stich, 2020; Viegas & Henriques, 2021). Therefore, as a practical implication, it is recommended that humor and flow training be used in other professional fields. For successful implementation, the individual requirements and framework conditions in the individual professions should be considered when developing the training and coaching programs.

Conclusion

This thesis investigated whether humor as a resource in the healthcare sector can foster flow experience and reduce stress. In this thesis, a Humor-Flow Model was derived from research on humor, stress, and flow experience, and the hypotheses of the model were tested in two studies. It can be concluded from the results of this thesis that humor is an important construct in the healthcare sector to foster the flow experience and to cope with stress. Experiences of

humor and flow achieved positive effects for individuals and organizations. The approach to foster humor, flow, and reduce stress in healthcare is promising and can help to counteract the stressful working conditions of nurses and improve their work situation. Improving the current situation in healthcare can help nurses have fun and enjoy their work, experience less stress, and thus not want to quit the profession prematurely. Thus, fostering humor and flow and reducing stress can be a health and retention strategy in healthcare human resource management.

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Supplementary Material Chapter 5

Chapter 5: General Discussion

Supplementary Material Information

The tables presented in the Supplementary Material have already been presented in Chapters 3 and 4. For the presentation of the results of the Humor-Flow Model, the tables were slightly modified to make the relevant results for the Humor-Flow Model recognizable. The reference to the original tables is recognizable in the labeling of the tables.

TABLE S5.1 | Table 3.4 Buffering effects of sense of humor and appreciation using difference scores (Chapter 3).

	Stress		*Emotional Irritation*		*Emotional Exhaustion*		*Frequency of flow experience*		*Satisfaction – Work*		*Satisfaction – Life*		*Satisfaction – Work performance*		*Satisfaction – Well-being*	
	R^2	β	R^2	β	R^2	β	R^2	β	R^2	β	R^2	β	R^2	β	R^2	β
Appreciation																
- Patients	.01	-.11	.01	-.09	.06	-.25**	.09	.31**	.05	.22**	.00	-.05	.06	.23**	.00	.02
- Society	.00	-.04	.00	-.03	.00	-.03	.04	.19*	.00	.06	.02	-.14	.00	.01	.00	.06
Sense of humor	.01	-.11	.00	-.02	.04	-.20*	.03	.16*	.02	.13	.00	-.01	.00	.01	.00	-.03
- Enjoyment of humor	.01	-.08	.04	-.20*	.03	-.18*	.05	.23**	.05	.22**	.01	.07	.01	.12	.01	.10
- Laughter	.01	-.09	.01	.10	.00	-.06	.00	.03	.00	.04	.01	-.11	.00	-.01	.01	-.11
- Verbal humor	.01	-.08	.00	.01	.02	-.13	.02	.12	.02	.13	.01	.11	.00	.01	.00	.01
- Finding humor in everyday life	.00	-.03	.01	.12	.05	-.21**	.03	.16*	.01	.08	.00	-.03	.00	.05	.00	-.02
- Laughing at yourself	.02	-.14	.01	.08	.00	-.07	.00	.02	.00	.01	.02	-.12	.01	-.11	.01	-.12
- Humor under stress	.02	-.13	.00	-.06	.06	-.25**	.07	.26**	.06	.25**	.01	.11	.04	.20*	.01	.07

*Note. Significant results are shown in black; ** p < .010; * p < .050. n varies due to the pairwise deletion of data between 152 and 169.*

TABLE S5.2 | Table 3.2 Pearson correlations between sense of humor and psychological states before and during the COVID-19 pandemic (Chapter 3).

Scales	Sense of humor	Enjoyment of humor	Laughter	Verbal humor	Finding humor in everyday life	Laughing at yourself	Humor under stress
	Before the COVID-19 pandemic						
Stress (single item)	.04	.04	.06	.01	.04	-.00	.02
- Emotional irritation	-.22**	.00	-.23**	-.16*	-.21**	-.28**	-.23**
- Emotional exhaustion	-.05	.06	-.18*	.03	-.07	-.18*	-.10
Flow	.25**	.01	.32**	.15	.27**	.27**	.26**
- Absorption	.20**	.05	.27**	.08	.23**	.16*	.21**
- Challenge-skill-balance	.22**	-.00	.29**	.10	.24**	.26**	.21**
- Enjoyment	.24**	-.01	.30**	.18*	.25**	.26**	.23**
Satisfaction							
- Work	.18*	.01	.16*	.13	.27**	.15*	.15*
- Life	.22**	.02	.18*	.15*	.20*	.23**	.21**
- Work performance	.23**	.05	.22**	.28**	.22**	.34**	.17*
- Well-being	.26**	.01	.22**	.23**	.23**	.27**	.22**
Appreciation							
- Patients	.08	-.04	.15	.07	.15	.10	.17*
- Society	.17*	.13	.15	.10	.07	.06	.13
	During the COVID-19 pandemic						
Stress (single item)	-.08	-.03	-.03	-.08	.01	-.14	-.13
- Emotional irritation	-.17*	-.13	-.07	-.11	-.05	-.17*	-.25**
- Emotional exhaustion	-.19*	-.12	-.20*	-.10	-.16*	-.15*	-.27**
Flow	.35**	.22**	.33**	.22**	.34**	.22**	.43**
- Absorption	.29**	.22**	.27**	.23**	.31**	.16*	.40**
- Challenge-skill-balance	.30**	.18*	.31**	.14	.26**	.20**	.33**
- Enjoyment	.36**	.21**	.29**	.25**	.34**	.23**	.43**
Satisfaction							
- Work	.26**	.24**	.16*	.21**	.22**	.09	.34**
- Life	.15	.06	-.02	.23**	.10	.09	.22**
- Work performance	.17*	.14	.14	.21**	.18*	.16*	.31**
- Well-being	.18*	.11	.03	.20**	.19*	.11	.27**
Appreciation							
- Patients	.19*	.14	.24**	.19*	.22**	.11	.26**
- Society	.14	.12	.16*	.13	.11	.07	.19*

*Note. Significant results (two-tailed) are shown in black; ** p < .010 (two-tailed); * p < .050 (two-tailed). n varies due to the pairwise deletion of data between 161 and 173.*

TABLE S5.3 | Table S3.3 Intercorrelations before the COVID-19 pandemic (Chapter 3).

Scales	1	2	3	4	5	6	7	8	9	10	11	12	13
Stress (single item) (1)	1												
- Emotional irritation (2)	.30**	1											
- Emotional exhaustion (3)	.47**	.52**	1										
Flow (4)	-.28**	-.46**	-.58**	1									
- Absorption (5)	-.15*	-.36**	-.38**	.87**	1								
- Challenge-skill-balance (6)	-.24**	-.39**	-.52**	.92**	.69**	1							
- Enjoyment (7)	-.33**	-.48**	-.62**	.95**	.74**	.82**	1						
Satisfaction													
- Work (8)	-.41**	-.27**	-.52**	.57**	.40**	.52**	.60**	1					
- Life (9)	-.19*	-.33**	-.33**	.36**	.27**	.34**	.35**	.37**	1				
- Work performance (10)	-.19*	-.24**	-.38**	.36**	.23**	.35**	.38**	.50**	.32**	1			
- Well-being (11)	-.23**	-.36**	-.35**	.47**	.38**	.43**	.46**	.39**	.55**	.28**	1		
Appreciation													
- Patients (12)	-.27**	-.28**	-.30**	.47**	.34**	.44**	.44**	.40**	.15*	.25**	.14	1	
- Society (13)	-.17*	-.20*	-.21**	.30**	.18*	.30**	.30**	.14	.15	.06	.19*	.25**	1

*Note. Significant results (two-tailed) are shown in black; ** p < .010 (two-tailed); * p < .050 (two-tailed). n varies due to the pairwise deletion of data between 161 and 174.*

TABLE S5.4 | Table S3.4 Intercorrelations during the COVID-19 pandemic (Chapter 3).

Scales	1	2	3	4	5	6	7	8	9	10	11	12	13
Stress (single item) (1)	1												
- Emotional irritation (2)	.55**	1											
- Emotional exhaustion (3)	.58**	.59**	1										
Flow (4)	-.33**	-.43**	-.62**	1									
- Absorption (5)	-.20*	-.37**	-.44**	.87**	1								
- Challenge-skill-balance (6)	-.23**	-.33**	-.50**	.89**	.68**	1							
- Enjoyment (7)	-.39**	-.46**	-.67**	.93**	.72**	.74**	1						
Satisfaction													
- Work (8)	-.38**	-.45**	-.54**	.68**	.51**	.59**	.67**	1					
- Life (9)	-.34**	-.35**	-.33**	.39**	.30**	.32**	.40**	.48**	1				
- Work performance (10)	-.19*	-.37**	-.39**	.58**	.45**	.53**	.56**	.65**	.30**	1			
- Well-being (11)	-.45**	-.39**	-.49**	.48**	.36**	.40**	.48**	.57**	.59**	.42**	1		
Appreciation													
- Patients (12)	-.19*	-21**	-.27**	.52**	.48**	.46**	.46**	.41**	.18*	.35**	.28**	1	
- Society (13)	-.06	-.13	-.26**	.36**	.31**	.26**	.37**	.31**	.08	.26**	.31**	.41**	1

*Note. Significant results (two-tailed) are shown in black; ** p < .010 (two-tailed); * p < .050 (two-tailed). n varies due to the pairwise deletion of data between 166 and 174.*

TABLE S5.5 | Table 4.5 Intercorrelation of all study variables (Chapter 4).

Variable		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Sense of humor (t_0)	1																	
2	Sense of humor (t_1)	.74 **	1																
3	Enjoyment of humor (t_0)	.47 **	.30 **	1															
4	Enjoyment of humor (t_1)	.42 **	.54 **	.66 **	1														
5	Laughter (t_0)	.74 **	.61 **	.33 **	.39 **	1													
6	Laughter (t_1)	.57 **	.82 **	.19	.43 **	.77 **	1												
7	Verbal humor (t_0)	.83 **	.64 **	.25 *	.23 *	.51 **	.41 **	1											
8	Verbal humor (t_1)	.64 **	.84 **	.20	.32 **	.46 **	.63 **	.72 **	1										
9	Finding humor in everyday life (t_0)	.90 **	.65 **	.19	.22	.57 **	.45 **	.80 **	.57 **	1									
10	Finding humor in everyday life (t_1)	.72 **	.89 **	.16	.30 **	.57 **	.66 **	.67 **	.74 **	.74 **	1								
11	Laughing at yourself (t_0)	.79 **	.65 **	.11	.24 *	.55 **	.51 **	.63 **	.54 **	.77 **	.65 **	1							
12	Laughing at yourself (t_1)	.58 **	.82 **	.10	.29 **	.35 **	.60 **	.53 **	.62 **	.57 **	.76 **	.72 **	1						
13	Humor under stress (t_0)	.80 **	.51 **	.28 **	.23 *	.44 **	.32 **	.57 **	.41 **	.76 **	.50 **	.54 **	.33 **	1					
14	Humor under stress (t_1)	.56 **	.81 **	.16	.28 **	.37 **	.55 **	.43 **	.62 **	.54 **	.75 **	.43 **	.61 **	.60 **	1				
15	Perceived stress (t_1)	-.12	-.22 *	.02	-.02	-.12	-.23 *	-.07	-.09	-.13	-.18	-.19	-.33 **	-.08	-.21 *	1			
16	Work enjoyment during practical training (t_1)	.21	.38 **	.13	.19	.28 *	.36 **	.05	.26 *	.16	.33 **	.10	.31 **	.24 *	.37 **	-.56 **	1		
17	Flow frequency (t_1)	.18	.42 **	-.01	.08	.22	.35 **	.11	.27 **	.19	.39 **	.08	.37 **	.23	.50 **	-.26 *	.54 **	1	
18	Perceived meaningfulness of work (t_1)	.36 *	.41 **	.08	.03	.27 *	.28 **	.27 *	.31 **	.35 **	.46 **	.36 **	.40 **	.30 **	.45 **	-.37 **	.58 **	.48 **	1

***p < .001; *p < .050; Measuring points: t_0 = Baseline; t_1 = 6 months after the humor intervention.*

TABLE S5.6 | Table 4.6 Mediation models of the effect of the humor intervention (X) via sense of humor (M) on the dependent variable (Y) (Chapter 4).

	a-path				*b*-path				*c*-path				*c'*-path				indirect effect
Variable (Y)	**β**	***SE***	***t***		**β**	***SE***	***t***		**β**	***SE***	***t***		**β**	***SE***	***t***		**β; *CI***
Perceived stress (H2)	.20	0.10	2.00	*	-.22	0.10	-2.10	*	.04	0.10	-0.42	n.s.	.00	0.10	0.01	n.s.	β = -.04; -0.11 <CI < 0.00
Work enjoyment during practical training (H3)	.20	0.10	2.00	*	.36	0.10	1.76	**	.18	0.10	1.76	n.s.	.11	0.10	1.09	n.s.	β = .07; 0.07 <CI < 0.15
Flow frequency (H4)	.20	0.10	1.94	n.s.	.41	0.09	4.18	**	.12	0.10	1.20	n.s.	.04	0.10	0.44	n.s.	β = .08; 0.01 <CI < 0.17
Perceived meaningfulness of work (H5)	.20	0.10	2.00	*	.41	0.10	4.17	**	.12	0.10	1.12	n.s.	.03	0.10	0.34	n.s.	β = .08; 0.01 <CI < 0.17

*(H), Hypothesis; n.s., not significant; ** p < .001; * p < .050; X = independent variable (IG vs CG); M = mediator (sense of humor); Y = dependent variable.*