APPROACHES TO ASSESSING AUTONOMY IN BEHAVIOR AND SELF-REPORT

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"Autonomy is the condition under which what one does reflects who one is."

(Weinrib, 2019, p.8)

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We are stronger together.

Zusammenfassung

Autonomie ist die Bedingung, unter der das, was man tut, widerspiegelt, wer man ist (Weinrib, 2019, S.8). Dieses Zitat bringt den Kerngedanken der Autonomie auf den Punkt: die Übereinstimmung zwischen den eigenen inneren Werten und dem, wie eine Person handelt. Das ist eine schöne Idee. Denn wer will schon, dass sein Handeln von außen bestimmt oder kontrolliert wird?

In der klassischen Definition von Autonomie geht es genau um diese Unabhängigkeit von äußeren Umständen, die vor allem Murray (1938) geprägt hat. Murray charakterisiert Autonomie unter anderem als Widerstand gegen Beeinflussung und als Auflehnung gegen Autoritäten. Ähnlich beschreibt Piaget (1983) Individuen als autonom, wenn sie in ihrem Denken und Handeln unabhängig von äußeren Einflüssen und von der Autorität Erwachsener handeln können.

Spätere Arbeiten haben diese Gleichsetzung von Autonomie mit Abgrenzung oder Unabhängigkeit kritisiert (Bekker, 1993; Chirkov et al., 2003; Hmel & Pincus, 2002). Stattdessen verstehen sie Autonomie vielmehr als Fähigkeit (Chirkov, 2011; Rössler, 2017) und als ein grundlegendes menschliches Bedürfnis (Ryan & Deci, 2006). Nun steht die Selbstbestimmung im Vordergrund, basierend auf rational bestimmten Werten, um ein glückliches Leben zu führen (Chirkov, 2011).

Nach der Self Determination Theory (SDT, deutsch: Selbstbestimmungstheorie) ist die Autonomie ein Gefühl der Eigeninitiative und der Verantwortung für das eigene Handeln. Die Erfahrung von Interesse und Wertschätzung kann Autonomie stärken, während die Erfahrung externer Kontrolle, z.B. durch Belohnung oder Bestrafung, Autonomie einschränkt (Ryan & Deci, 2020). Im psychologischen Diskurs über Autonomie ist die SDT, die zwischen Autonomie und Unabhängigkeit unterscheidet, stark vertreten (Chirkov et al., 2003; Koestner & Losier, 1996; Weinstein et al., 2012). Denn während eine Person autonom um Hilfe bitten oder sich auf andere verlassen kann, kann eine Person auch unfreiwillig allein und unabhängig sein. Es ist interessant festzustellen, dass diese Definitionen wieder sehr nahe an der etymologischen Bedeutung des Begriffs aus dem Griechischen $\alpha v \tau \grave{o} \nu o \mu o \zeta$ liegen. Interessanterweise kommen diese Definitionen der etymologischen Bedeutung des Begriffs aus dem Griechischen (autonom) wieder sehr nahe.

Die beiden Stränge von Autonomie als Unabhängigkeit und Autonomie als Selbstbestimmung spiegeln sich auch in der wichtigen Unterscheidung zwischen reaktiver und reflektiver Autonomie von Koestner and Losier (1996) wider. Reaktive Autonomie bedeutet Widerstand gegen äußere, insbesondere interpersonelle Einflüsse. Diese Interpretation ist eng mit dem klassischen Verständnis von Autonomie als Abgrenzung und Unabhängigkeit von anderen (Murray, 1938), also interpersonell, verbunden. Reflektive Autonomie hingegen bezieht sich auf intrapersonale Prozesse der Selbstbestimmung oder Selbstregulation, wie sie in der Selbstbestimmungstheorie (Ryan et al., 2021) definiert werden.

In dieser Dissertation haben wir uns dem Konzept mit drei verschiedenen Herangehensweisen genähert und uns dabei vorallem auf seine Messung und Operationalisierung konzentriert: Zunächst haben wir in Artikel 1 die Laien- und die wissenschaftliche Perspektive verglichen, um einen Einblick in die Charakteristika von Autonomie zu erhalten. In den Artikeln 2 und 3 haben wir anschließend Autonomie im Verhalten als Widerstand gegen äußere Einflüsse experimentell getestet. Ebenso analysierten wir den Zusammenhang zwischen verschiedenen Selbstberichtsmaßen für Autonomie und dem autonomen Verhalten: In Artikel 2 untersuchten wir, wie Menschen während der frühen COVID-19-Pandemie auf den Einfluss von Message Framing und der Autorität des Absenders auf soziales Distanzierungsverhalten reagierten. In Artikel 3 schließlich betrachteten wir den Widerstand gegen den Einfluss einer deskriptiven Norm bei der Beantwortung objektiver Fragen und setzten dies in Beziehung zu autonomen Persönlichkeitsmerkmalen.

Im ersten Artikel haben wir einen semiqualitativen Bottom-up-Ansatz verwendet, um Einblicke in die Laienperspektive auf Autonomie zu gewinnen und diese mit dem wissenschaftlichen Verständnis abzugleichen. Dabei orientierten wir uns an einem Ansatz, der von Kraft-Todd und Rand (2019) für den Begriff des Heldentums entwickelt und genutzt wurde. Dazu haben wir fünf Komponenten von Autonomie aus der philosophischen und psychologischen Literatur abgeleitet: Würde, Unabhängigkeit von anderen, Moral, Selbstbewusstsein und Unkonventionalität.

In drei präregistrierten Online-Studien haben wir diese wissenschaftlichen Komponenten mit dem Laienverständnis von Autonomie verglichen. In Studie 1 nannten die Teilnehmenden ($N = 222$) mindestens drei und bis zu zehn Beispiele für autonomes (selbstbestimmtes) Verhalten. Hier nannten die Teilnehmenden 807 aussagekräftige Beispiele, die wir für Studie 2 systematisch zu 34 repräsentativen Items zusammenfassten. Diese wurden dann von neuen Teilnehmenden ($N = 114$) hinsichtlich ihrer Autonomie bewertet. Schließlich übertrugen wir die fünf am höchsten und die fünf am niedrigsten bewerteten Autonomie-Items in Studie 3 ($N = 175$). Hier baten wir die Teilnehmenden zu bewerten, wie stark die Items die Merkmale Würde, Unabhängigkeit von anderen, Moral, Selbstbewusstsein und Unkonventionalität repräsentieren. Wir fanden heraus, dass alle Komponenten zwischen Items mit hoher und niedriger Autonomie unterscheiden, nicht aber Unkonventionalität. Daraus schließen wir, dass die Laiensicht mit den wissenschaftlichen Eigenschaften Würde, Unabhängigkeit von anderen, Selbstbewusstsein und Moral übereinstimmt. Darüber hinaus zeigt die qualitative Analyse der Beispiele, dass Laien Beispiele nannten, die sowohl unter die reaktive als auch reflektive Definitionen von Autonomie fallen.

Im Gegensatz zu früheren experimentellen Studien zu Compliance, Gehorsam und Konformität (Asch, 1961; Bostyn & Roets, 2017; Cialdini & Goldstein, 2004; Kundu & Cummins, 2013) wurde Autonomie bisher seltener verhaltensbasiert untersucht (Swann & Jetten, 2017). Aus diesem Grund wollten wir Autonomie experimentell messbar machen.

In Artikel 2 und 3 konzentrierten wir uns auf reaktive Autonomie, um die Widerstandsfähigkeit gegenüber äußeren Einflüssen zu erfassen und zwischen den Personen zu vergleichen. Wir verwendeten in beiden Studien ein ähnliches Paradigma: ein Manipulationsdesign mit Prä- und Post-Messung. Nach der ersten Antwort wurde eine Manipulation gezeigt, nach der die Teilnehmenden die Möglichkeit hatten, die erste Antwort zu ändern. Diesen Unterschied zwischen Prä- und Post-Manipulation bezeichnen wir als Shift. Personen, die ihre Antwort nicht ändern, werden in unserem Konzept als Nicht-Shifter bezeichnet, also als reaktive Autonome, während Personen, die ihre Antwort ändern, als Shifter bezeichnet werden. Zusätzlich bildeten wir die Summenscores der Shifts pro Person als graduelles Maß für reaktive Autonomie, d.h. je weniger Shifts, desto höher die reaktive Autonomie.

Wir haben die Studie in Artikel 2 in Deutschland in den ersten Tagen der COVID-19-Pandemie im April 2020 durchgeführt. Da sich die meisten Menschen zu Hause aufhielten, war die Kommunikation über soziale Medien für viele eine wichtige Möglichkeit, in Kontakt zu bleiben und Informationen zu erhalten. Wir untersuchten, ob ein autoritäres/ kontrollierendes Message-Framing effektiver ist als ein neutrales Message-Framing oder ein moralisierendes/prosoziales Message-Framing und ob die selbstberichtete Autonomie der Adressat:innen diese Effekte abschwächen kann.

Die Teilnehmenden ($N = 708$) antworteten prä und post der Manipulation auf sozial distanzierende Verhaltensweisen (z.B. Kontaktreduzierung, Tragen einer Maske). Die Twitter-Nachrichten (autoritär, moralisierend, neutral) hatten entweder einen Absender mit hoher Autorität (Staatssekretär) oder einen Absender mit niedriger Autorität (Sozialarbeiter), so dass es insgesamt sechs verschiedene Bedingungen gab, denen die Teilnehmenden randomisiert zugeordnet wurden. Wir fanden, dass die Botschaften im Durchschnitt die Unterstützung der Teilnehmenden für die Vorschriften erhöhten, allerdings aufgrund von Deckeneffekten nur geringfügig. In Übereinstimmung mit der reaktiven Autonomie zeigten Teilnehmende mit einem hohen Maß an selbstberichteter Autonomie konsistentere Antworten über die beiden Messungen hinweg, d.h. weniger Antwortverschiebungen. Im Gegensatz dazu veränderten Personen mit geringer selbstberichteter Autonomie ihre Reaktionen stärker in beide Richtungen, d. h. sowohl in Richtung der Botschaft als auch entgegengesetzt. Es gab keine bedeutsamen Unterschiede zwischen den verschiedenen Nachrichtenformaten oder dem Absenderstatus.

In Artikel 3 haben wir das Paradigma weiterentwickelt, indem wir die moralisch konnotierten Items zur sozialen Distanzierung durch objektive Items ersetzt haben. Statt dessen verwendeten wir in der Prä-/ Post-Messung Fragen zu Faktenwissen: zum räumlichen Denken (Raven, 2019) und zum Allgemeinwissen (Liepmann et al., 2012). Auch hier wurde reaktive Autonomie als Verhaltenswiderstand operationalisiert, diesmal jedoch gegenüber der (manipulierten) deskriptiven Norm.

Als Selbstberichtsmaß für Autonomie verwendeten wir einen bis dato unvalidierten

Fragebogen zu Self- and Other-Reliance. Darüber hinaus wählten wir den Index of Autonomy Functioning (Weinstein et al., 2012) und die Autonomy-Connectedness-Skala (Bekker & van Assen, 2006) als Maße für die reflektive Autonomie. Studie 1 ($N = 392$) wurde online durchgeführt, und in Studie 2 replizierten wir das Paradigma vor Ort in unserem Labor an der Goethe Universität Frankfurt.

Die Teilnehmenden beantworteten 26 Versuchsdurchgänge, bestehend aus objektiven Fragen im Multiple-Choice-Format, bevor und nachdem sie eine falsche Rückmeldung über die Antwortverteilungen angeblicher vorheriger Teilnehmenden erhielten. Die Rückmeldung war in 50% der Durchgänge inkongruent mit den ursprünglichen Antworten der Teilnehmenden. In diesem Fall zeigte das Feedback eine Balkendiagramm-Verteilung, bei der die Antwort der Befragten in der Minderheit war. Im Gegensatz dazu war die Rückmeldung in den anderen 50% der Fälle kongruent zu initialen Antwort der Teilnehmenden (Ablenkungstrials). Die Ergebnisse von Mehrebenenmodellen in beiden Studien zeigten, dass die initiale Richtigkeit der Antworten der Teilnehmenden und ihre initiale Sicherheit die Wahrscheinlichkeit des Shifts verringerten. Das Gleiche galt für die initiale Richtigkeit auf der Personenebene. Sowohl in der Online- als auch in der Laborstudie stieg die Other-Reliance mit der Wahrscheinlichkeit des Shiftens. Interessanterweise stand in der Online-Studie Other-Reliance nur dann in einem signifikanten Zusammenhang mit der Wahrscheinlichkeit des Shiftings, wenn die Teilnehmenden in die Analyse miteinbezogen wurden, die zugaben, die richtigen Antworten nachgeschlagen zu haben.

In der Laborstudie zeigten wir bei der Aufgabe zum räumlichen Denken, dass Nicht-Shifter signifikant höhere Werte in den Bereichen Self-Reliance und Selbstbewusstsein und signifikant niedrigere Werte in den Skalen Other-Reliance und Anfälligkeit für Kontrolle aufwiesen als Shifter. In Artikel 3 haben wir den Widerstand gegen deskriptive Norm Einflüsse als Beispiel für reaktive Autonomie operationalisiert, der in Laborexperimenten gemessen werden kann. Darüber hinaus haben wir Belege für das Persönlichkeitsprofil reaktiv autonomer Personen angeführt.

Zusammenfassend haben die drei Artikel wichtige weitere Implikationen für das Verständnis von reaktiver und reflektiver Autonomie aufgezeigt, insbesondere in Bezug auf das Autonomieverständnis von Laien und die Messung von reaktiver Autonomie im Verhalten. Die Ergebnisse verdeutlichen, wie Laien autonomes Verhalten definieren und welchen Stellenwert Würde, Unabhängigkeit von anderen, Moral und Selbstbewusstsein in ihrer Auffassung von Autonomie haben. Diese Erkenntnisse stimmen auch mit der empirischen Theorie überein. Die Beispiele und Einschätzungen der Laien spiegeln, die in der Literatur kontrovers diskutierte Unterscheidung zwischen reaktiver Autonomie als Unabhängigkeit und reflektiver Autonomie als Selbstbestimmung, wider.

Als gemeinsamer Aspekt zwischen reaktiver und reflektiver Autonomie lässt sich die höhere Bereitschaft, sich äußeren Einflüssen oder Kontrollen zu widersetzen, festhal-

ten. Auch die Selbsteinschätzung zeigt einen Zusammenhang zwischen den Konstrukten, reaktiver und reflektiver Autonomie auf mehreren Subskalen. Es ist jedoch wichtig, bei der Betrachtung von Autonomie im Verhalten und in der Selbsteinschätzung klar zwischen den beiden Konstrukten zu unterscheiden, um eine Ambiguität des Begriffs zu vermeiden.

Darüber hinaus haben wir zwei Paradigmen zur Messung von Verhaltensautonomie entwickelt und getestet: Widerstand gegen Message Framing und Widerstand gegen deskriptives Normfeedback. Beide waren mit selbstberichteten Maßen reaktiver Autonomie assoziiert. Widerstand gegen Message Framing war positiv mit selbstberichteter Autonomie assoziiert, und das Sich-Verlassen auf Andere (Other-Reliance) war ein negativer Prädiktor für Widerstand gegen deskriptives Normfeedback. Darüber hinaus bieten Self- und Other-Reliance erste Ansatzpunkte für eine selbstberichtete Messung von reaktiver Autonomie.

Insgesamt konnten wir wichtige Merkmale reaktiver Autonomie ableiten: Personen, die reaktiv autonom handelten und sich nicht von äußeren Einflüssen leiten ließen, zeigten ein höheres Bedürfnis nach Kognition (need for cognition) und waren weniger anfällig für Kontrolle als Personen, die ihr Urteil nach der Manipulation änderten. Außerdem waren die Nicht-Shifter selbstständiger (self-reliant) und selbstbewusster.Darüber hinaus schlugen wir zwei experimentelle Paradigmen zur Messung reaktiver Autonomie vor und lieferten aufschlussreiche Belege für die Messung reaktiver und reflektiver Eigenschaften. Diese Ergebnisse tragen zu einem umfassenderen Verständnis von Autonomie bei und können künftige Forschungen und Interventionen in der Psychologie anregen.

Summary

"Autonomy is the condition under which what one does reflects who one is" (Weinrib, 2019, p.8). This quote encapsulates the core idea of autonomy, namely the correspondence of one's inner values with one's actions. This is a beautiful idea. After all, who wants their actions to be determined or controlled from the outside?

The classical definition of autonomy is precisely about this independence from external circumstances, which Murray (1938) primarily coined. Among other things, Murray characterizes autonomy as resistance to influence and defiance of authority. Similarly, Piaget (1983) describes individuals as autonomous, independent of external influences, in their thinking and actions, and foremost, adult authority. Subsequent work criticized this equation of autonomy with separation or independence (Bekker, 1993; Chirkov et al., 2003; Hmel & Pincus, 2002). In lieu thereof, autonomy is defined as an ability (Chirkov, 2011; Rössler, 2017) and as an essential human need (Ryan & Deci, 2006). Focus is now on self-governing while relying on rationally determined values to pursue a happy life (Chirkov, 2011). According to Social Determination Theory (SDT), autonomy is about a sense of initiative and responsibility for one's own actions. The experience of interest and appreciation can strengthen autonomy, whereas experiences of external control, e.g., through rewards or punishments, limit autonomy (Ryan & Deci, 2020). In the psychological discourse of autonomy, SDT is strongly represented (Chirkov et al., 2003; Koestner & Losier, 1996; Weinstein et al., 2012). Notably, SDT distinguishes between autonomy and independence as follows. While a person can autonomously ask for help or rely on others, a person can also be involuntarily alone and independent. Interestingly, these definitions are again closer to its etymological meaning as self-governing, originating from Greek $\alpha\upsilon\tau\grave{o}\nu o\mu\zeta$ (autonomous).

The two strands of autonomy as independence and autonomy as self-determination are also reflected in the vital differentiation into reactive and reflective autonomy by Koestner and Losier (1996). Resisting external influence, particularly interpersonal influence, is what reactive autonomy entails. This interpretation is closely related to the classical concept of autonomy as separation and independence from others (Murray, 1938). On the other hand, reflective autonomy concerns intrapersonal processes, such as self-governing or self-regulation, as defined in Self-Determination Theory (Ryan et al., 2021).

In this dissertation, we investigated the concept in three different approaches while focusing on its assessment and operationalization: To begin, in Article 1, we compared the layperson's and the scientific perspective to each other to gain insight into the characteristics of autonomy. Then, in Articles 2 and 3, we experimentally tested behavioral autonomy as resistance to external influences. Simultaneously, we investigated the link between various autonomy trait measures and autonomous behavior. As a result, in Article 2, we looked at how people reacted to the effects of message framing and sender authority on social distancing behavior during the early COVID-19 pandemic. Finally,

in Article 3 we investigated the resistance to a descriptive norm in answering factual questions, in the context of autonomous personality.

In our first article, we used a semi-qualitative bottom-up approach to gain insights into the laypersons' perspective on autonomy and compare it to the scientific notion. We followed a design proposed by Kraft-Todd and Rand (2019) on the term heroism. We derived five components from philosophical and psychological literature: dignity, independence from others, morality, self-awareness, and unconventionality. In three preregistered online studies, we compared these scientific components to the laypersons' understanding of autonomy. In Study 1, participants ($N = 222$) listed at least three and up to ten examples of autonomous (self-determined) behaviors. Here, the participants named 807 meaningful examples, which we systematically categorized into 34 representative items for Study 2. Next, new participants ($N = 114$) rated these regarding their autonomy. Finally, we transferred the five highest-rated autonomy and the five lowest-rated autonomy items to Study 3 ($N = 175$). We asked participants to rate how strongly the items represented dignity, independence from others, morality, self-awareness, and unconventionality. We found all components to distinguish between high and low autonomy items but not for unconventionality. Thus, we conclude that laypersons' view corresponds with the scientific characteristics of dignity, independence from others, self-awareness, and morality. A qualitative analysis of the examples also showed that both reactive and reflective definitions of autonomy are prevalent.

Contrary to experimental studies on compliance, obedience, and conformity (Asch, 1961; Bostyn & Roets, 2017; Cialdini & Goldstein, 2004; Kundu & Cummins, 2013), autonomy was rarely assessed behaviorally (Swann & Jetten, 2017). Therefore, we wanted to measure autonomy experimentally. We focused on reactive autonomy to capture the resistance to external influences and between-person comparisons in Articles 2 and 3. We applied a similar paradigm in both studies: a manipulation design with pre- and post-measurement. After the initial response, we displayed a manipulation, after which the participant had the option to alter the initial response. We refer to this difference between pre-and post-manipulation as shifting. People who do not shift are considered non-shifters, the reactively autonomous in our conceptualization, whereas persons changing their response are considered shifters. Additionally, we build the sum score of shifts per person as a gradual measure, meaning the lower the number of shifts, the higher is the reactive autonomy.

The preregistered study in Article 2 was conducted in Germany in the early days of the COVID-19 pandemic in April 2020. Public health communication was even more critical at that time. Since most people were staying at home, communication via social media was, for many, a meaningful way to maintain contact and receive information. Therefore we used a social media post on Twitter as our manipulation: we examined whether authoritarian/controlling message framing is more effective than neutral mes-

sage framing compared to moralizing/prosocial message framing and whether recipients' self-reported trait autonomy can mitigate these effects. Participants ($N = 708$) responded to social distancing behaviors at the time (e.g., reducing contact, wearing a mask) before and after the manipulation was presented. The Twitter messages (authoritarian, moralizing, neutral/controlling) had either a high-authority sender (state secretary) or a low-authority sender (social worker), so in total, there were six different conditions to which participants were randomly assigned. We found that, on average, the messages increased participants' support for the regulations, but only slightly due to ceiling effects. Consistent with reactive autonomy, self-reported highly autonomous participants showed more consistent responses across the two measures, i.e., fewer response shifts. On the contrary, individuals low in self-reported autonomy shifted more in both directions, according to the message and in opposition to it. There were no meaningful differences between the different message framing or sender status.

In Article 3, we further advanced the paradigm by replacing the morally connoted social distancing items with objective items. Instead, we used factual, spatial reasoning (Raven, 2019), and general knowledge (Liepmann et al., 2012) questions in the pre-/post-measurement. Again, reactive autonomy was operationalized as behavioral resistance, but this time against the (manipulated) descriptive norm. As a self-report measure, we used a self-reliance and other-reliance questionnaire, which we constructed based on established autonomy questionnaires to measure reactive autonomy. Additionally, we chose the index of autonomy functioning (Weinstein et al., 2012) and the autonomy-connectedness scale (Bekker & van Assen, 2006) as measures for reflective autonomy. Study 1 ($N = 392$), preregistered on OSF, was conducted online, and in Study 2 ($N = 93$), also preregistered on OSF, we replicated the paradigm on-site in our laboratory at the Goethe University Frankfurt. Participants responded to 26 trials consisting of the factual questions in a multiple-choice format before and after receiving bogus feedback about the response distributions of prior participants. The feedback was "incongruent" with the participants' initial responses in 50% of the trials. In this case, the feedback showed a bar graph distribution where the participant's response was in the minority. In contrast, in the other 50% of trials, the participant's response was "congruent" with the majority of responses (distraction trials). We found that participants shifted significantly more often when they received incongruent feedback than congruent feedback, with a significant decrease in their decision confidence. Cross-classified multilevel models in both studies revealed that the initial correctness of participants' initial responses and their initial confidence decreased the likelihood of shifting. The same was true for initial correctness at the person level. In both the online and laboratory study, other-reliance increased with the likelihood of shifting. Interestingly, in the online study, other-reliance was meaningfully related to the likelihood of shifting only when participants admitted to looking up the correct answers were included in the analysis. In Study 2, on the spatial reasoning

task, we found that non-shifters had significantly higher scores on self-reliance and self-awareness and significantly lower scores on other-reliance and susceptibility to control scales than shifters. In Article 3, we have introduced resistance to descriptive influence as an example of reactive autonomy that can be measured in laboratory experiments. Furthermore, we provided evidence for the trait profile of the reactively autonomous individuals as identified by this paradigm.

Across the three articles, we provided implications for a better understanding of reactive and reflective autonomy in terms of laypersons' understanding of autonomy and behavioral measurement of reactive autonomy. The present work showed how laypersons exemplify autonomous behaviors. Dignity, independence from others, morality, and self-confidence are characteristics of autonomy from lay and empirical perspectives. The examples and evaluations of laypersons reflect the controversy about the difference between reactive autonomy as independence and reflective autonomy as self-determination found in the literature.

To avoid ambiguity of the term, it is essential to distinguish between both when assessing autonomy in behavior and self-report. The common ground of reactive and reflective autonomy is that both are more likely to resist external influence or control. Nonetheless, in self-report, the constructs of reactive and reflective autonomy can be associated.

We applied two paradigms to measure behavioral autonomy: resistance to message framing and resistance to descriptive norm feedback. Both were related to self-reported measures of reactive autonomy. The resistance to message framing was positively related to self-reported trait autonomy, and dependence on others was a negative predictor of resistance to descriptive norm feedback. Additionally, self- and other-reliance provide a first orientation for a self-report measurement of reactive autonomy.

Overall, we were able to derive important characteristics of reactive autonomy: People who acted reactively autonomously and were not guided by external influences, showed a higher need for cognition and were less susceptible to control than people who changed their judgement after the manipulation. In addition, the non-shifters were more self-reliant and self-aware. In addition, we proposed two experimental paradigms for measuring reactive autonomy and provided insightful evidence for measuring reactive and reflective traits. These results contribute to a more comprehensive understanding of autonomy and may stimulate future research and interventions in psychology.

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1 Theoretical Background

Introduction

Personal autonomy is highly valued by most people. In common parlance, it is often casually understood as the ability to think and act independently. Who would want to be controlled by others? However, we are not born with this quality or ability. To become a person capable of making decisions, we initially depend on parents or caregivers. The balance between autonomy and attachment is already the core contradiction at a young age and remains at least a great challenge for most of our lives. As humans, we need not only autonomy but also attachment. Finding a balance between these two needs, hence more or less in harmony with oneself and one's social environment, is essential for well-being (Kukita et al., 2022; Rudy et al., 2007; Sheldon et al., 2005).

In psychological research, autonomy has been described and studied mainly in the context of growing up in the tension between attachment (Erikson, 1993; Piaget, 1983), moral development (Kohlberg et al., 1983), and as a motivational need within Self-Determination Theory (Deci & Ryan, 2012; Ryan & Deci, 2020). However, past research shed less light on how individuals remain steadfast and stand by their values despite external circumstances, even though this autonomy is the basis for democratic decision-making.

Notably, there are also more extreme situations or circumstances where autonomy is very limited or impossible. We are currently observing this in Iran, where many people want to determine for themselves how they live, if they cover their hair, or whom they love. Under such conditions, it becomes clear that the desire for personal autonomy can even outweigh physical integrity or one's own life.

We value autonomy, but what makes us value autonomy so much? In this dissertation, we investigated autonomy on a theoretical and experimental level. With this purpose in mind, we explored the concept in three different approaches, particularly its assessment and operationalization. First, in Article 1, we compared the scientific view of autonomy with a lay persons' perspective to gain insight into the characteristics of autonomy. Then, in Articles 2 and 3, we assessed behavioral autonomy experimentally as resistance to external influences.

Similarly, we also examined the relationship between several autonomy trait measures and autonomous behavior. Therefore, in Article 2, we investigated resistance to the influence of message framing and sender authority on social distancing behavior during the early COVID-19 pandemic. In contrast, in Article 3, we examined resistance to the influence of a descriptive norm in answering factual questions in the context of autonomous personality. In the following, we will start by giving an overview of the complex definitions and understandings of autonomy while keeping in mind its operationalization. Next, we will discuss the behavioral assessments of autonomy, followed by self-report autonomy measures. Lastly, we conclude this chapter with the research questions that drove us to do the studies reported in this dissertation.

Definition and a Short Distinction of Related Concepts

Etymologically, the term autonomy derives from the Greek $\alpha\upsilon\tau\grave{\mathrm{o}}\nu\omicron\mu\omicron\varsigma$. It consists of the words '$\alpha\upsilon\tau\grave{\mathrm{o}}$' self and '$\nu\omicron\mu\omicron\varsigma$' law. It means being self-governing or governing independently. Being autonomous means more than having liberty or being unrestricted. Importantly, autonomy involves more than mere freedom (Allmark, 2008). For example, if we think of an infant, an adult with schizophrenia, or an animal, all might be unrestricted without being autonomous. Typically, when we think of autonomy, we assume mature, rational persons who act according to their ideas and values and are not (easily) deflected by any external influences.

The self-governing meaning of autonomy goes back to early Greek philosophy, especially Aristotle (Allmark, 2008). In his work *Posterior Analytics*, he refers to various sciences as autonomous bodies of knowledge that generate their own laws (Pérez & Ziemke, 2007). For Aristotle, autonomy derives from an epistemological consideration. He examines how we know what we know and whether or not we can know. However, he applies this concept ontologically to the capacities of living organisms - in particular, to what their capacities are (Pérez & Ziemke, 2007).

We frequently invoke autonomy as a moral ideal, a psychological need, and even as a human right, particularly the right to determine oneself independently of external determinants; indeed, violating a person's autonomy is considered a serious moral offense. However, while contemporary philosophy names Kant as the originator of the concept of autonomy (May, 1994; Taylor, 2005), Kant's own interpretation of the term appears to differ in significant ways from current interpretations (Sensen, 2012).

For Kant, autonomy is the prerequisite for being a moral agent. Moreover, from being autonomous, i.e., being their own moral lawgiver, personal dignity arises (Kant, 1870). Kant defines three main characteristics of autonomy: first, he calls the possession of one's own will necessary since it is a form of causality of rational beings. Second, Kant adds that being free, in the sense of negative freedom, means that one is not determined by prior physical or psychological causes. Finally, he mentions being free in the sense of positive freedom, which means the ability to act according to a law of reason, one's own morality, or the categorical imperative (Kant, 1870; Sensen, 2012).

Kant attributes autonomy categorically, as if to every person qua person. Some voices, however, consider it more beneficial to describe autonomy as a gradual capacity (Rössler, 2017). According to Mill, it is a matter of seeking one's own good in one's own way as long as the freedoms of others remain untouched (Mill, 1966). In contrast to Kant, Mill speaks of autonomy as the ability to seek one's own good.

In contemporary psychology, autonomy often is defined as acting in accordance with one's self, feeling self-determined and as the voluntary author of one's action. Hence, it is coined, especially by Self-Determination Theory (Deci & Ryan, 2012; Ryan & Deci, 2006)[SDT]. Notably, within SDT, autonomy preserves its initial literal meaning of self-

governance, or rule by the self (Ryan & Deci, 2006). SDT focuses on the study of human motivation and personality. Autonomous individuals act intentionally and, according to SDT, embrace their actions with interest, responsibility, and commitment (Ryan & Deci, 2020).

It is also vital to distinguish between autonomy and reactance. In Psychological Reactance Theory (PRT), behavioral freedom is essential, and when this freedom is threatened, people are strongly driven to restore it (Miron & Brehm, 2006; Rosenberg & Siegel, 2018). This motivation to regain threatened freedom is psychological reactance. For the arousal of reactance, a person must first possess this freedom (Miron & Brehm, 2006). Consequently, reactance is reactive, not proactive, because it can only arise in other forces motivating the person to give up freedom. However, autonomy does not only exist in the threat of freedom.

In many areas of social cognition, research has consistently demonstrated two basic content dimensions, known as the "Big Two," namely, agency and communion (Abele et al., 2008). Autonomy and agency can be understood as closely related concepts. While agency refers to traits relevant to goal achievements, such as ambition or skill, community refers to traits relevant to establishing and maintaining social relationships, such as kindness or fairness (Abele et al., 2008, 2016; Bazzani, 2022). Agency and communion represent two recurring challenges in human life, namely pursuing individual goals and belonging to social groups (Ybarra et al., 2008). Nevertheless, there is a crucial difference between autonomy and agency. Whereas autonomy requires the capacity to distance oneself from social contexts, it does not imply the ability to influence the latter (Bazzani, 2022). However, autonomy operates in social contexts concerning the ability to personalize the various socially ascribed roles and experience the embodied sense of self-determination.

The Classical Understanding of Autonomy

The classical concept of autonomy understands the idea mainly as separation from others. It originates primarily from Murray (1938), who characterized autonomy as resistance to influence or coercion, defiance of authority, seeking freedom, and striving for independence. Thereby, the need for autonomy is the primary motive for "those who wish neither to lead or be led, those who want to go their own way, uninfluenced and uncoerced by others" (Murray, 1938, p.152). Koestner and Losier (1996) add that Murray's conceptualization sees autonomy as a need for the distribution of human power. Moreover, developmental psychologists share a similar view on autonomy. For example, for Piaget, persons are (morally) autonomous when they can decide and act independent of external influences, especially of adult authority (Piaget, 1983). Others define (moral) autonomy as resistance against authoritarian and normative forces (Erikson, 1993; Kohlberg et al., 1983).

In this classical view, morality and autonomy are closely interconnected, which shows the link to the Kantian concept of moral autonomy. Moreover, this involves a significant degree of resistance to influence. For example, the adjective checklist (ACL) for measuring autonomy by Gough and Heilbrun (1983) illustrated this in the description of the high and low autonomous persons: high autonomous persons are described as independent, assertive, and self-willed while tending to be indifferent to others' feelings. As a result, they are perceived egoistic and stubborn (Gough & Heilbrun, 1983). Accordingly, they describe low autonomous persons as more conventional, risk-avoidant, looking for security in the familiar and accustomed, and welcoming to the direction of others.

Erikson (1993) classifies autonomy in a relationship to other persons and not only independent from them. More precisely, he explains that developing autonomy requires a well-developed early trust in attachment figures. This consideration further evolves the original definition of autonomy as egoistic and purely independent from others. Furthermore, subsequent work also criticized the equation of autonomy to separation and independence of others (Bekker & van Assen, 2006; Chirkov et al., 2003; Hmel & Pincus, 2002). In the following, newer approaches to autonomy, taking this criticism into account, are discussed.

Modern Approaches to Autonomy

In modern psychology, the concept of autonomy becomes broader and is no longer understood mainly in differentiation from others. Instead, autonomy is defined as an ability (Chirkov, 2011; Weinrib, 2019) and as an essential human need Ryan and Deci (2006). According to Chirkov (2011, p.611), "autonomous persons establish in a self-determined fashion their own life goals, criteria for their happy and good lives, and the moral standards, which they rationally decide to pursue in order to be happy and successful."

To be autonomous, persons need the ability to distinguish between right and wrong and to self-reflect on their actions and judgment (Bublitz & Merkel, 2009). Moreover, agents must also be reason-responsive in the sense that they consider a better argument. This also requires, to some extent, an understanding of the world and the consequences of their actions (Bublitz & Merkel, 2009).

Furthermore, Bandura (2006, p.165) states, "People do not operate as autonomous agents. Nor is their behavior wholly determined by situational influences". He explains further that human functioning consists of a reciprocal interplay of intrapersonal, behavioral, and environmental determinants (Bandura, 1986). His concept of agency consisting of intentionality, forethought, self-reactiveness, and self-reflectiveness is closely related to modern autonomy definitions.

Moreover, other scholars also share this view of autonomy as an ability. Autonomy is defined as the ability to separate themselves from the roles, norms, and institutions

of their social context. While social norms and roles influence this capacity, the self can break free (Bazzani, 2022).

Autonomy also can be described as a process reflecting how individuals see themselves in relationship to others. Within this process, persons "renegotiate their emotional, behavioral, and value dependence upon others" (Anderson et al., 1994, p.343). The authors also postulate four factors for the Worthington Autonomy Scale: emotional autonomy, behavioral autonomy, value autonomy, and family loyalty autonomy. As one can derive from the labels, the factors include independence to some extent and relationships with others to the other extent.

Research showed that the decision to rely on others for emotional support, including parents, could have significant positive effects on well-being, even during adolescence, when independence and reliance on oneself have traditionally played an essential role in development (Ryan & Lynch, 1989).

Anderson et al. (1994) defined *emotional autonomy* as the desire to exercise self-control, emotional independence, interpersonal competence, and adequate social commitments. Next, *behavioral autonomy* means the freedom to act and accept responsibility for one's actions. Similarly, the ability to make moral, vocational, and religious decisions is called *value autonomy.* Lastly, when parents and children operate under the implicit assumption that essential satisfaction and security can only be obtained within the family, being free of any "binding" by one's parents or family of origin is *family loyalty autonomy.*

Self Determination Theory (Deci & Ryan, 2012) is predominant in recent psychology discourse of autonomy (Chirkov et al., 2003; Koestner & Losier, 1996; Weinstein et al., 2012). Within SDT, autonomy retains its primary etymological meaning of self-governance or rule by the self. The autonomy concept here derives from the existential tradition in SDT (Lynch, 2013). It implies a sense of volition and choice instead of feeling pressured or coerced into one's actions. It is important to note that in SDT, autonomy is not synonymous with independence. A person can choose autonomously to rely on another person for resources and support. Support of another one's autonomy in a relationship means being attentive to and interested in the other person's point of view and fostering choice rather than attempting to control the other person or impose one's own agenda (Reis et al., 2018; Ryan et al., 2005).

Reactive versus Reflective Autonomy - a Plea for both Concepts

Hmel and Pincus (2002) derived three theoretical formulations of autonomy from personality and clinical psychology: autonomy as self-governance, autonomy as individual differentiation, and autonomy as a vulnerability factor for depression (Bergamin et al., 2022; Bieling et al., 2000). In the two polarities (relatedness or self-definition) model, psychopathology emerges from an imbalance between relatedness/attachment and self-definition/autonomy (Blatt & Luyten, 2009; Luyten et al., 2007). It is argued similarly

in the sociotrophy and autonomy theory, which describes sociotrophy as the social dependency for positive interchange with others and autonomy as an individual investment in preserving and increasing own independence, mobility, and personal rights (Bieling et al., 2000).

The conceptualization of autonomy as self-governance and autonomy as separation derived from theoretical work of Wiggins (1996, 1997) and empirical studies by Koestner and Losier (1996) distinguishing autonomy in reactive and reflective. In the following, we will focus on the latter differentiation of autonomy.

According to Koestner and Losier (1996), scholars distinguish between reactive and reflective autonomy. Resisting outside influence, particularly from an interpersonal standpoint, is reactive autonomy. The early work of Murray (1938) led to this interpersonal concept of autonomy, which emphasizes people's desire to resist influence or coercion. Koestner and Losier (1996) proposed to call this type of autonomy "reactive" and to capture it with the ACL autonomy scale (Gough & Heilbrun, 1983). In contrast, reflective autonomy focused on intrapersonal tasks like self-governing or self-regulation. This intrapersonal conception of autonomy emphasizes people's desire to feel like the origin of their actions and to have the power to determine their behavior, according to self-determination theory (Deci & Ryan, 2012; Ryan et al., 2021).

The work of Koestner and Losier (1996) shows that reactive and reflective autonomy are only weakly related. Both have a direct impact on daily social and affective experiences. Distinguishing between reactive and reflective forms of autonomy ensures that we avoid terminological ambiguity and can help us better understand how autonomy develops and manifests. Thus, we need both concepts for a better understanding of individual autonomy. For this paper, we first address a broad understanding of autonomy in Article 1, including reflective and reactive autonomy, as we focus here on the broad lay person perspective. For behavioral assessment in Studies 2 and 3, we focus on reactive autonomy because our first goal was to make autonomy measurable in its raw state under experimental conditions. Thus, the focus was on an interpersonal comparison in standardized situations rather than on basic motivational mechanisms and intrapersonal processes, which are also particularly difficult to measure. In addition, we focused on external and thus standardized influences that also support behavioral assessments of reactive autonomy.

Behavioral Assessment of Autonomy

Interestingly, a review of the social psychology literature shapes the impression that when people are confronted with challenging circumstances, they tend to lose their ability to adhere to their values. Early classic studies of conformity, compliance, obedience, and the bystander effect showed that participants often yielded to external pressures, even even if it meant abandoning their moral principles or disregarding their sensory data

(Asch, 1961; Bostyn & Roets, 2017; Cialdini & Goldstein, 2004; Kundu & Cummins, 2013). In contrast, few studies have addressed agency and autonomy experimentally (Swann & Jetten, 2017).

To measure autonomy experimentally, we focused on reactive autonomy, mainly as resistance to external influences (Koestner & Losier, 1996). Reviewing the literature on conformity and compliance, one finds many different ways to operationalize external influences on behavior and decision-making. In the following, we explain and justify how we have selected the two behavioral paradigms, namely resistance to message framing and resistance to descriptive norm feedback. Further, we describe the underlying theoretical principles.

Resistance to Message Framing

Message framing refers to seemingly insignificant changes in content wording without changing its actual content. Without changing the actual content, e.g., merely framing the same frequencies, can lead to significant changes in decision-making (Tversky & Kahneman, 1981). First, Tversky and Kahneman studied why people systematically violate consistency and coherence when making rational decisions. They demonstrated that seemingly insignificant changes in the formulation (framing) of decision problems lead to significant and systematic shifts in decision preferences, even though the expected value of all options remains mathematically the same (Tversky & Kahneman, 1981). Three different types can be distinguished: the framing of acts, the framing of contingencies, and the framing of outcomes. (Tversky & Kahneman, 1981). Since then, many empirical studies have confirmed that message framing in communication significantly impacts judgment and decision-making (Steiger & Kühberger, 2018). For social media messages, participants considered a gain-framed message authored by an expert and with a high number of 'likes' the most credible message (Borah & Xiao, 2018).

Prosocial frames that emphasize the role of others, such as loved ones, one's children or relatives, and even strangers, have been shown to increase vaccination readiness, more so than a self-focused frame (Kelly & Hornik, 2016). Under the uncertain conditions of the early pandemic, solid and imposing norms can provide a sense of security about how one should or should not behave. In an experiment on online conformity, the tendency to conform significantly increased when the participants were uncertain of their answers (Wijenayake et al., 2020).

In addressing the early COVID-19 pandemic, public health communication was critical to promoting community compliance with health and safety regulations. Therefore, in Article 2, we investigated differences in participants' resistance to framing influence with moralizing/prosocial vs. authoritarian/controlling message framing by either a high authority sender, state secretary, or a low authority sender, social worker.

We operationalized high and low authority by the author of the posts in Article

2. In the famous Milgram experiment, not all participants could be influenced to comply (Milgram, 1974; Russell, 2011), and it was precisely those individuals who resisted authority that we aimed to identify.

Resistance to Descriptive Norm Feedback

Social norms contain essential information about how one should behave or how others normally behave and have been used in conformity and compliance experiments (Cialdini & Goldstein, 2004). For example, Wijenayake et al. (2020) used a descriptive norm, "bogus feedback," to examine online conformity. Similarly, bogus feedback was used in decision-making in trolley-type moral dilemma scenarios (Bostyn & Roets, 2017), which resulted in an asymmetric conformity effect: participants would adhere to deontological rather than consequentialist majorities. However, a potential criticism of this approach was the lack of within-person comparison, as they only compared conformity rates between groups. We therefore chose to use a pre/post measurement design, in all present studies, to examine within-person changes in behavior as a result of feedback.

In addition, Wijenayake et al. (2020) used objective and subjective items to examine online compliance and the influence of contextual and personal factors. In a fabricated bar graph, we positioned the participants' initial response in the relative majority or minority of the feedback. Wijenayake et al. (2020) found that participants were most compliant in three cases: when answering objective questions, when a participant was unsure of their answer, and finally, when they saw a significant large opposing majority.

Thus, we chose to use the descriptive influence of social norms for the experiments in Article 2 and 3. Whereas for Article 2, we used highly moral and prosocial items (social distancing behavior during the early COVID-19 pandemic), we omitted all moral intent of the items by using merely factual questions in Article 3.

Self-Report Assessment of Autonomy

Despite its significance to human experience and frequent use in literature, autonomy still lacks theoretical coherence and consistent operationalization (Hmel & Pincus, 2002). Hmel and Pincus (2002) also conclude that autonomy measures often do not assess the same construct. Most autonomy measures operationalize the reflective and motivational autonomy definition (Anderson et al., 1994; Bekker & van Assen, 2006; Deci & Ryan, 1985; Guerra & Giner-Sorolla, 2010; Weinstein et al., 2012). Nevertheless, in addition to our experimental approach to reactive behavioral autonomy, we wanted to capture reactive autonomy in a self-report measure. Koestner and Losier (1996) used the Adjective Checklist (ACL) to assess reactive autonomy (Gough & Heilbrun, 1983). However, we wanted an item-based procedure to be able to specify concrete behaviors and characteristics in items beyond one-word adjectives.

For this purpose, we decided to take several items suitable for reactive autonomy from existing questionnaires. First, we used ten items of the Moral Agency Scale (Black,

2016), e.g., "In most cases, I can make my own decisions about what is right or wrong in a situation." Next, we adapted six items from the Trier Personality Questionnaire (Becker, 1989), e.g., "I like to go my own way." Lastly, we added six items from the protective social comparison scale (Laux & Renner, 2002), e.g., the inverted item "My behavior often depends on how I feel others wish me to behave." As a result, the trait autonomy questionnaire in Article 2 consisted of 22 items assessing reactive autonomy, which are displayed in Appendix A1 and the Moral Agency items in Appendix A2.

In the initial attempt in Article 2, we also included ten items taken from the Moral Agency Scale (Black, 2016) because here we were measuring prosocial/moral behavior, namely the social distancing regulation at that time. In Article 3, though, we focused on reactive autonomy on objective factual questions and abstained from further including the moral aspect, represented in the moral agency items, for our scale construction.

Self-Reliance and Other-Reliance Questionnaire

We have composed the self- and other-reliance questionnaire using 12 items from two existing questionnaires. First, we adopted six items from the autonomy scale of the Trier Personality Questionnaire (Becker, 1989), e.g., "I like to go my own way." The following six items we included are from the protective social comparison scale (Laux & Renner, 2002), e.g., inverted item "My behavior often depends on how I feel others wish me to behave." All items were measured on a scale from 1 ("do not agree at all") to 5 ("completely agree") see Table 1.

The construct *self- and other-reliance* describes the reference to internal (self) and external (other) agents during decision-making. Self-reliance can be understood as the tendency to trust one's thinking and intuition. In contrast, other-reliance describes the preference to trust the evaluations of others more than one's own. In the following, we show a brief overview of the scale construction. For more details, see the additional online materials on Open Science Framework (OSF).

We conducted an exploratory factor analysis (EFA) with the sample of Article 2 (N=708) to examine the dimensionality of the items (Flora & Flake, 2017). Based on the EFA, we identified two dimensions with three items each. Next, we used another sample for confirmatory factor analysis and convergent validity with agency and communion (N=477). Lastly, with the sample conducted in Study 1 of Article 3 we checked for the final scale's measurement invariance and criterion validity (N=392).

Autonomy-Connectedness Scale

In the classical view of autonomy, the capacity to feel and behave independently is predominant, which in Western societies is often more associated with masculinity (Blatt, 2004). Based on criticism of the classical concept of autonomy, insights into the process of gender differentiation and the development of gender identity by feminist authors (Bekker, 1993; Chodorow, 1995) autonomy-connectedness was developed. It

Table 1

Items of Self- and Other-Reliance Questionnaire as Presented in Article 3

		English translation	German original
Self-reliance (SR)	1	I like to make important decisions on my own.	Wichtige Entscheidungen treffe ich gerne allein.
	2	I want to take responsibility for my life alone.	Die Verantwortung für mein Leben möchte ich allein übernehmen.
	3	I like to go my own ways.	Ich gehe gerne meine eigenen Wege.
Other-reliance (OR)	4	When I am uncertain how to act in a social situation, I look to the behavior of others for cues.	Wenn ich nicht weiß, wie mich in einer bestimmten Situation verhalten soll, orientiere ich mich am Verhalten anderer.
	5	I try to pay attention to the reactions of others to my behavior in order to avoid being out of place.	Ich versuche die Reaktionen anderer auf mein Verhalten zu registrieren, damit ich mich nicht selbst ins Abseits stelle.
	6	It is important to me to fit in to the group I am with.	Es ist wichtig für mich, mich in die Gruppe, in der ich mich gerade aufhalte, einzupassen.

Note. Items were measured on a Likert-type scale ranging from 1, "do not agree at all," to 5, "completely agree."

incorporates presumed feminine aspects of identity and combines the (more masculine viewed) need for separation and independence with the need for intimacy and functioning in intimate relationships. The Autonomy-Connectedness Scale (ACS) consists of three sub-scales: self-awareness, sensitivity to others, and capacity for managing new situations. Autonomy-connectedness can be seen as "the capacity to be on one's own as well as to be with others" (Bekker & van Assen, 2006, p.52). Therefore, we use autonomy-connectedness for construct validation of self- and other-reliance in the second study of Article 3.

Index of Autonomy Functioning Scale

Lastly, we also wanted to compare self- and other-reliance to an autonomy construct based on the Self-Determination Theory (Deci & Ryan, 2012; Ryan et al., 2021). In an SDT-based view, autonomy can be distinguished from independence which is then close to self-reliance, because individuals can be, on the one hand, willingly or autonomously dependent and, on the other hand, forced or controlled to rely or depend on others (Ryan et al., 2005; Weinstein et al., 2012). Thus, the comparison between self-reliance and autonomy formulations from SDT is particularly interesting, and two measurement instruments can be used for this purpose.

The General Causality Orientations Theory Scale (GCOS) consists of three sub-scales(Deci & Ryan, 1985). First, when persons drive by own choice, based on awareness of one's needs and goals, it is called *autonomy orientation.* Second, the *controlled orientation* where persons look for external controls or internally controlling imperatives. Furthermore, lastly, the *impersonal orientation* where the perception dominates that most things are beyond one's intentional control. This scale is based on short text vignettes. Therefore, the format is not comparable to the item format. We wanted to use another item-based questionnaire to avoid method-driven effects (vignettes vs. items).

Index of Autonomy Functioning (IAF), on the other hand, uses an item-based format to measure dispositional autonomy, which consists of the three sub-scales: susceptibility to control, interest taking, and authorship/self-congruence (Weinstein et al., 2012). Individuals with a high degree of dispositional autonomy have self-initiated or self-approve of their actions, such that they experience their actions as self-congruent and initiated. Interest-taking and authorship/self-congruence are the positive factors of dispositional autonomy, while susceptibility is the negative factor. Together with autonomy-connectedness (Bekker & van Assen, 2006), we use the IAF for construct validation of self- and other-reliance in the second study of Article 3.

Research Questions

The present work tries to assess autonomy in behavioral and self-report measures. We distinguish between reactive and reflective autonomy. Reactive autonomy equals resisting external influence, particularly from a between-person comparison. Reflective autonomy is seen as an ability to achieve self-determination and focuses on intraindividual processes. The main aim of this dissertation was gain a better empirical understanding of individual autonomy, the behavioral and experimental assessment of autonomy.

Article 1 targets the theoretical conceptualization of reactive as well as reflective autonomy. We use laypersons' view and compare it to scientific notions. In contrast, Articles 2 and 3 focus on reactive autonomy and its behavioral assessment. The approaches also vary in their methods: in Article 1, the three studies followed a semi-qualitative bottom-up approach, whereas Articles 2 and 3 are experimental assessments of behavioral autonomy in context with trait autonomy. In the following, we outline the questions that drove the three empirical studies.

Article 1 (Zey & Windmann, 2022)

In this first set of studies, we identified scientific components of autonomy and compared these with a laypersons' perspective. Therefore, we questioned laypersons in three online studies using a bottom-up approach inspired by Kraft-Todd and Rand (2019). Participants first listed examples of autonomous behavior, which we qualitatively categorized into 34 categories. Next, in Study 2, the 34 categories were rated to which degree they reflected autonomy. Lastly, in Study 3, participants rated the high-autonomy

and low-autonomy items from Study 2 regarding scientific criteria for autonomy. This approach included reactive and reflective autonomy while focusing on a broad layperson-friendly perspective.

1. How do laypersons describe autonomy? Precisely, how do they exemplify concrete autonomous behavior?

2. Whether and to what degree do the scientific components and the laypersons' perspectives relate to each other?

Article 2 (Zey & Windmann, 2021)

In Articles 2 and 3, we assessed autonomy at the behavioral level with a similar paradigm: we examined the difference between pre-/post-manipulation for the behavioral assessment of reactive autonomy, which we refer to as shifting. Each item at which a person changes their answer after the manipulation is thus considered a shift. As a result, we refer to people who shift their responses after receiving feedback as shifters. Importantly, we focus on the non-shifters, who stick to their initial responses after the manipulation. We regard these non-shifters as reactively autonomous individuals.

We conducted an online study (N = 708) at the onset of the COVID-19 pandemic to investigate the influence of message framing on social distancing behavior. We presented items about social distancing behaviors following current governmental regulations, and participants responded how much these reflected their behavior at two-time points. Previous to the message framing manipulation (pre-measure) as their current behavior, and then again afterward (post-measure) as intentional future behavior.

We used a 3 (message framing) x 2 (sender) between-subject design combined with a within-person measurement (before and after the tweet manipulation). We randomly assigned participants to one of the six between-factor groups (sender: state secretary or social worker; message framing: authoritarian, moralizing, or neutral) to examine reactive autonomy in the context of autonomous personality. We used 22 items of established scales to measure trait autonomy.

1. Can a framed social media message increase the endorsement of social distancing behavior? Are there differences between the different senders and message frames?

2. Can experimental autonomy (not-shifting) be predicted by a person's trait autonomy?

Article 3

Article 3 is a further concrete development of Article 2, in which we replaced the morally connoted social distancing items with objective items. Instead, we used factual questions in the pre-/post-measurement and manipulated the participants through

a descriptive norm. The descriptive norm was a manipulated answer distribution by an allegedly former study sample. Again, we used a between- and within-subject design to examine reactive autonomy in the context of autonomous personality. For this purpose, we used the self- and other-reliance scale, which we constructed based on established autonomy questionnaires. In addition, we analyzed the correlations of self- and other-reliance with two other autonomy questionnaires. We chose the index of autonomy functioning (Weinstein et al., 2012) as a measure for reflective autonomy and the autonomy-connectedness scale, (Bekker & van Assen, 2006) to account for an approach highlighting not only the independent but also the social and interdependent human nature. In addition, we examined personality traits such as the need for cognition and the Big Five in conjunction with self- and other-reliance.

1. Can experimental autonomy (not-shifting) be predicted by self- and other-reliance?

2. How do situation-specific variables like participants' initial confidence, feedback correctness, or task type influence the probability of shifting?

3. Do the persons who are not shifting, in our understanding, the reactively autonomous individuals, differ in certain traits from the persons who are shifting after the manipulation?

4. Are self- and other-reliance connected to the sub-scales of the index of autonomy functioning scale and the autonomy-connectedness scale?

2 Summaries of Empirical Studies

Article 1: Grassroots Autonomy: A Laypersons' Perspective on Autonomy

Zey, E., & Windmann, S. (2022). Grassroots Autonomy: A Laypersons' Perspective on Autonomy. *Frontiers in Psychology, 13.* https://doi.org/10.3389/fpsyg.2022.871797

The multitude of existing autonomy definitions illustrates how abstract and difficult it is to define and operationalize the term (Keenan, 1999). However, regardless of this frequent use, the definitions are often vague. Furthermore, there is even less communication about the understanding of autonomy between scientists and the general public.

To improve the understanding of what autonomy means from an everyday perspective, we wanted to compare the laypersons' view to the scientific perspective, inspired by a bottom-up approach to the term *heroism* (Kraft-Todd & Rand, 2019). Therefore, we reviewed the philosophical, social science, and psychological literature and derived five components repeatedly connected with autonomy.

As the first component, we considered *dignity*, which emerges from being one's own lawgiver and being autonomous (Kant, 1870). Moreover, others state that individual autonomy reflects an admirable trait and the source of human dignity (Racine et al., 2021).

Next, we characterized *independence from others* as an autonomy component. Piaget defines a person as morally autonomous when their decisions and actions are independent of any external influences, particularly authority influences (Piaget, 1983).

Another concept often discussed with autonomy is *self-awareness*, meaning the awareness of one's opinions, wishes, and needs. This ability to regulate attention, emotions, and behaviors is essential for autonomy because, otherwise, one would only react to the situations rather than living according to values and striving for long-term goals (Racine et al., 2021).

Moreover, moral autonomy is linked to Kant's philosophy like no other and plays a major role in philosophy and psychology. *Morality* outlines the "right" and "wrong" in human behavior (Ellemers et al., 2019), e.g., fair play versus cheating. Thus, we propose morality as another autonomy characteristic.

Lastly, we added *unconventionality* as an autonomy component to our design. Post-conventionality is the highest level of moral development, meaning being unbound by norms and conventions but following one's own values (Kohlberg et al., 1983). Additionally, Warren and Campbell (2014) view extreme autonomy as neglecting typical traditions and not following such.

Method

It is important to note that we repeated the analysis with $N = 285$ for the online study, excluding those who admitted to having looked up at least one of the questions, see Supplemental Materials. The main pattern of the results was the same as in the whole sample $N = 392$, except for other-reliance in cross-classified models predicting the

probability of shifting. Interestingly, when excluding the data of the persons looking up questions, other-reliance is no longer meaningful for shifting, excluding those who do indeed behaviorally rely on others rather than on their own evaluation changes whether trait other-reliance significantly explains the variance of the shifting probability.

We compared these scientific components to the laypersons' understanding of autonomy in three semi-qualitative, preregistered online studies. In Study 1, we started with the qualitative bottom-up approach. Here, participants ($N = 222$) listed at least three and up to ten examples of autonomous (self-determined) behaviors. The participants in Study 1 named, on average, 3.9 examples, yielding a meaningful total of 807. Next, with the help of naive research assistants, we systematically categorized these examples into 34 representative items for the subsequent studies. The complete list of unedited responses, categorization, and editing steps is archived on OSF.

Then, in Study 2, we asked a different sample of participants ($N = 114$) to rate "how autonomous" each of the 34 items "is to them" on a five-point Likert scale (1 = "not at all autonomous" to 5 = "completely autonomous"). Finally, we transferred this study's five highest and lowest autonomy-rated items to Study 3.

Lastly, in Study 3, participants ($N = 175$) rated these five highest and the five lowest autonomy items regarding "how strongly these stand for" the components (dignity, independence from others, morality, self-awareness, and unconventionality) on a five-point Likert scale (e.g., 1 = "not at all independent from others" to 5 = "completely independent from others").

We expected the five highest autonomy items to produce higher ratings of each component than those rated lowest in autonomy. Additionally, we assumed dignity, independence from others, morality, self-awareness, and unconventionality to be moderately correlated. All data and scripts can be accessed online in the OSF project.

Results and Discussion

First of all, on average, the 34 representative items received very high autonomy ratings in autonomy $M = 3.92$, $SD = 0.59$ on a five-point scale, and all item categories contained between 9 and 46 examples collected in Study 1. In Table 2 the five highest and lowest autonomy ratings of Study 2, including the frequencies of mention in Study 1, are displayed.

As preregistered, in Study 3, we found a main effect of autonomy level (high versus low autonomy), $F(1,174) = 441.94$, $p < 0.01$, $\eta^2 = 0.12$, and a significant effect for the components, $F(4, 696) = 204.44$, $p < 0.01$, $\eta^2 = 0.39$. Furthermore, the interaction effect between the autonomy level and the components was also significant, $F(4, 696) = 110.61$, $p < 0.001$, $\eta^2 = 0.07$.

Using pair-wise Wilcoxon comparisons, we identified that dignity, independence from others, morality, and self-awareness significantly distinguished between high- and low-autonomy items. Lastly, except for unconventionality, we found the expected corre-

Table 2

Five Highest and Five Lowest Autonomy Categories with Frequencies of Mentions in Study 1 and with Mean Autonomy Ratings of Study 2 in Ascending Order

	Item description (English translation)	Study 1 Frequencies	Study 2 *M(SD)*
High	Choosing partners	27	4.33 (0.90)
	Staying true to oneself	16	4.31 (0.88)
	Thinking critically and questioning	18	4.31 (0.93)
	Deciding for oneself	46	4.29 (0.88)
	Determining with whom one surrounds oneself with	25	4.18 (0.86)
Low	Acting uninfluenced by external factors	31	3.60 (1.16)
	Travel	21	3.56 (1.18)
	Shaping one's living situation	27	3.55 (1.03)
	Designing working conditions	23	3.46 (1.00)
	Acting contrary to societal expectations and laws	23	3.34 (1.18)

Note. Study 1: $N = 222$, Study 2: $N = 114$.

lations between the components (Table 3). Figure 1 illustrates this trend, implying that high autonomy items were rated higher on dignity, independence from others, morality, and self-awareness than low autonomy items, but high autonomy items were rated lower on unconventionality and low autonomy items higher in unconventionality.

Across these three consecutive studies, we identified how laypersons exemplify autonomous behaviors and how autonomous they rate them. The participants rated behaviors characterized by high autonomy significantly higher in their perceived dignity, independence from others, morality, and self-awareness than behaviors low in autonomy. This indicates that the laypersons' view of four of the five components follows the proposed scientific literature.

We found different themes by comparing the five high-autonomy items with the five low-autonomy items. For example, the high-autonomy items focus on the relationship of the self with others (e.g., "determining with whom one surrounds oneself with" or "choosing partners") and on reflected decision-making (e.g., "deciding for oneself" or "thinking critically and questioning"). On the other hand, the low-autonomy items cover various themes, ranging from "travel" to "shaping one's living situation." Interestingly, two of the lowest-rated items are similar to classical autonomy definitions, "acting uninfluenced by external factors" and "acting contrary to societal expectations and laws." One pattern, though, is that the low-autonomy items have a more selfish/immoral connotation, while the high-autonomy items seem to have a more prosocial/moral intent. This tendency highlights the extent to which morality and autonomy are intertwined.

The effect in the ratings was reversed for unconventionality, i.e., the high-autonomy

Table 3

Descriptive Statistics and Correlations r(p) between the Components

	M	SD	1	2	3	4
1. Dignity	4.08	.53	-			
2. Independence	3.78	0.55	.50 (<.01)	-		
3. Morality	3.81	0.66	.61 (<.01)	.33 (<.01)	-	
4. Self-awareness	4.31	0.47	.60 (<.01)	.39 (<.01)	.46 (<.01)	-
5. Unconventionality	2.65	0.94	-.05 (.54)	-.10 (.21)	-.08 (.32)	-.11 (.16)

*Note.* $N = 175$, significance level: $p = 0.01$ (Holm-Bonferroni corrected).

items were rated significantly lower than the low-autonomy items. On the contrary, in the examples listed in Study 1, examples very close to unconventionality were listed as "unconventional thinking" and "acting despite conventions." which indicates that unconventionality is related to autonomy. Further investigation is needed to clarify the connection between unconventionality and autonomy. Instead, the inverted framing of unconventionality (being outside the conventions) could have caused the difference, whereas the other components had a positive frame. Additionally, very few individuals reach the post-conventional developmental level, and its concept is challenging to grasp.

The study design of the present three studies did not distinguish between reactive and reflective autonomy. The examples show patterns of both reactive and reflective autonomy. The prosocial/moral nature of the high-autonomy items shows how important it is to view autonomy in an interdependent and reflective way, e.g., "choosing a partner," as well as in the reactive independent manner, e.g., "acting uninfluenced by external factors." Our findings contribute to our understanding of autonomous behaviors and connect laypersons' intuition with scientific theory. Scholars can practically apply psychological research components operationalizing autonomy in scales, surveys, and experiments. Nevertheless, also taking specific features into account could benefit certain domains. For example, the importance of autonomy for patients' dignity is relevant in health care and nursing.

This bottom-up approach comes with some limitations. First, the study design relies on the examples provided in Study 1, and it is an exploratory investigation where further replications and confirmatory studies are needed. Additionally, the samples in all three studies show selection biases. For example, we analyzed the gender difference in Study 2, but it did not seem to influence the results. Participants' academic background might also have affected the examples, e.g., choosing a profession. A significant limitation of the design is the variation of abstractness between the samples and the categories. Furthermore, only ten examples out of the 34 categories were used in Study 3 for time reasons and to avoid repetitive errors. Additionally, even though the ten items varied in their level of autonomy, even the low-autonomy items obtained relatively high autonomy

Figure 1

Rating Distribution of each Component in Study 3 sorted by Autonomy Level
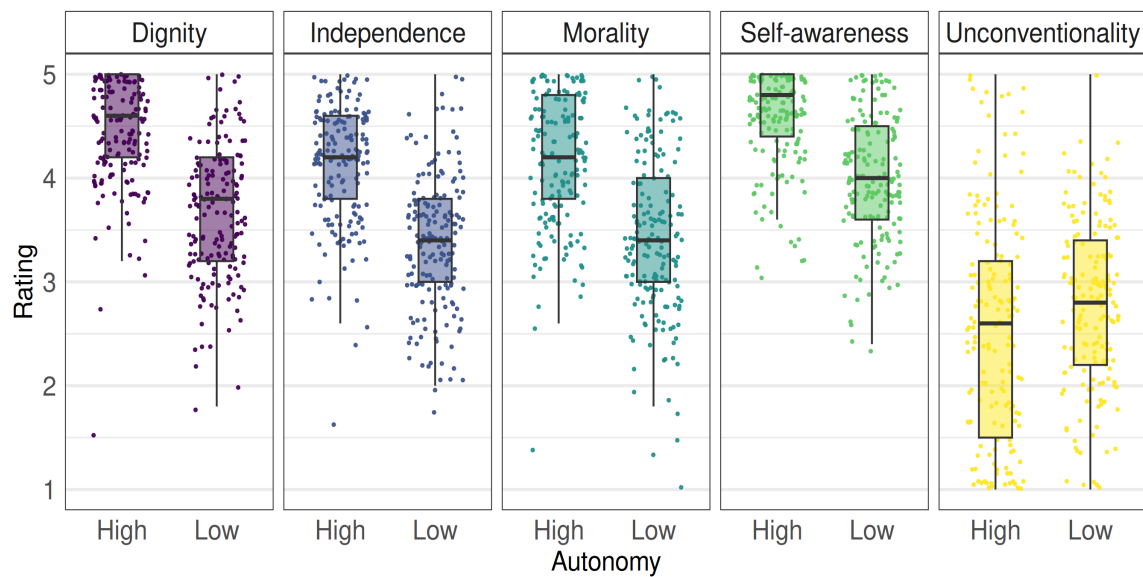
ratings in general.

In summary, the current research contributes to characterizing the components determining autonomy. Furthermore, we present an empirical method for connecting academic notions of autonomy to practical applications. In this way, our findings outline the behavioral implications of autonomy in everyday life. Future work should broaden the theoretical concept of individual autonomy and empirical understanding of autonomy as a trait.

Article 2: Effects of Message Framing, Sender Authority, and Recipients' Self-Reported Trait Autonomy on Endorsement of Health and Safety Measures during the Early COVID-19 Pandemic

Zey, E., & Windmann, S. (2021). Effects of Message Framing, Sender Authority, and Recipients' Self-Reported Trait Autonomy on Endorsement of Health and Safety Measures during the Early COVID-19 Pandemic. *International Journal of Environmental Research and Public Health, 18*(15), 7740. https://doi.org/10.3390/ijerph18157740

Public health communication can be vital in promoting health and safety measures, especially during a pandemic. Therefore, we investigated in a preregistered study whether moralizing/prosocial message framing is more successful than authoritarian/controlling or neutral message framing. Message framing refers to seemingly insignificant changes in how content is phrased without changing its initial intent, which can lead to significant changes in decision-making (Tversky & Kahneman, 1981). Furthermore, we measured trait autonomy to account for personality differences in the subjects' susceptibility to the framing influence, primarily focusing on whether high trait autonomy lessens the impact.

It is important to emphasize that we conducted the study online in the early days of the COVID-19 pandemic in Germany, $N = 708$ (454 female, no diverse) from April 16, 2020, to April 20, 2020. Public health communication aimed to increase societal adherence to protective health and safety measures at that time. Direct contact with persons beyond the own household was minimal and social media was, for many, one of the only ways to communicate. Social media can hugely impact how we see and experience our societies and what we value, feel, and act. Therefore, we used a Twitter post, a so-called tweet. Not only the message's substance but also how and who delivers it is critical when trying to persuade individuals to engage in a particular behavior. Thus, we used three different types of message framing for the tweets (authoritarian/controlling, moralizing/prosocial, or neutral), which either a high-authority sender (secretary of state) or a low-authority sender (social worker) posted as illustrated in Figure 2.

Method

We presented behavioral items about social distancing behaviors following current governmental regulations in Germany at the time (see Table 4) and asked participants how much these reflected their own behavior on a scale from 1 "not true at all" to 5 "completely true."

Participants rated these statements at two-time points: previous to the tweet manipulation (pre-measure) as their current behavior, and then again afterward (post-measure) as their intention for future behavior. All in all, we used a 3 (message framing) x 2 (sender) between-subject design combined with a within-person measurement (before and after the tweet manipulation). We randomly assigned participants to one of the

Figure 2

Authoritarian, Moral, and Neutral Message Framing sent by the State Secretary (High Authority Sender)

Note. The messages were the same for the Social Worker (Low Authority Sender), where "Secretary of State" was replaced by "Social Worker."

six between-factor groups (state secretary, $n = 354$, and social worker, $n = 353$; message framing: $n = 233$ authoritarian, $n = 238$ moralizing, $n = 236$ neutral). First, participants responded to the social distancing behaviors. Next, we assessed trait autonomy with 22 items (McDonald's $\omega = 0.81$) from three established questionnaires. Next, we used six items of the autonomy scale from the Trier Personality Questionnaire (Becker, 1989), ten items of the Moral Agency Scale (Black, 2016), and six items from the protective comparison scale (Laux & Renner, 2002). Then, after these trait questions, we displayed the tweet manipulation. Next, we asked participants to respond again to the social distancing items, now as intentions, then name the senders' occupation and rate the senders' trustworthiness and morality. Furthermore, we displayed both the authoritarian and the moral text, and participants rated the effectiveness of the messages. We also assessed the perceived threat to the participants, their households, society, and social demographics.

Results and Discussion

Participants rated the social worker's trustworthiness, $M = 3.45$, $SD = 0.92$, significantly higher than the state secretary's trustworthiness, $M = 3.34$, $SD = 0.97$, $t(703.28) = -1.65, p = 0.049$. We found the same pattern for morality. The social worker, $M = 3.96$, $SD = 0.81$, was rated significantly more moral than the state secretary, $M = 3.63$, $SD = 0.87$; $t(701.33) = -5.15$, $p < 0.01$. Moreover, participants rated the moral/prosocial message, $M = 4.27$, $SD = 0.91$, as significantly more effective than the authoritarian/controlling message, $M = 3.14$, $SD = 1.29$; $t(706) = -19.81$, $p < 0.01$.

Across all items, the intervention ratings significantly increase after the manipula-

Table 4

English Translations of Social Distancing Behaviors as presented in Article 2

	Item
1	I reduce contact with other people outside the apartment to an absolute minimum.
2	I keep a minimum distance of 1.5 m to other people in public wherever possible.
3	I only spend time in public alone, with members of my household, or with one other person.
4	There are only very limited reasons for me to leave the house: emergency care, important purchases, doctor's visit, necessary work, meetings, exams, sport, physical activity.
5	I wear a protective mask when I am in other indoor rooms.
6	For as long as schools and kindergartens are closed, I prevent my children from having any contact, or I would do this if I had children.
7	I abstain from personal contact with older relatives and persons at risk.

tion, before $M = 4.07$, $SD = 0.68$) versus after $M = 4.14$, $SD = 0.71$; $F(1,701) = 19.55$, p < 0.01 but the effect was very small $\eta^2 = 0.002$). The pre-intervention ratings were overall very high, and 56 % were at the scale's maximum. As a result, we analyzed each item separately. Interestingly, item 5, about wearing a mask, did not show the ceiling effect. Here we found that participants endorsed wearing a mask significantly more after reading the tweet ($M = 2.79$, $SD = 1.53$ than before ($M = 2.23$, $SD = 1.50$; $F(1,701)$ $= 220.66$, $p = 0.03$, $\eta^2 = 0.03$).

Notably, the probability of shifting between pre-intervention and post-intervention correlates significantly negatively with trait autonomy, $r(705) = -0.18$, $p < 0.01$). However, the linear regression analysis showed no overall effect of trait autonomy in predicting the probability of shifting.

Our findings show that, at the time, the social distancing regulations against the spread of COVID-19 were generally well-supported. The self-reported compliance with the rules was already very high before the manipulation. Nonetheless, across all message frames and both senders, the social media tweet increased this endorsement of the rules. Ceiling effects could have caused this small effect at the approval of the regulations. The ceiling effects were prevalent in all items, with one exception. The item about wearing a protective mask indoors was not extremely distributed. Here the manipulation increased the willingness to wear a mask significantly. At the time, wearing a mask to prevent the spread of COVID-19 was still controversial, and even the World Health Organization warned that wearing a mask might cause a false sense of safety (Feng et al., 2020). Therefore, influencing public health communication using social media is likely to work when there is more uncertainty on how effective the controlled behavior will be.

Across all groups, the absolute pre-to-post intervention differences correlated negatively with trait autonomy, meaning the higher participants' autonomy, the less they changed in their decision-making between the two rating measures. To put it another way, people with high trait autonomy resisted modifying their evaluations after reading the message more than people with low trait autonomy. Conversely, the individuals low in autonomy shifted in their ratings more than those high in autonomy. Interestingly their shifting is going in both directions, following the message and opposing it.

The effects of the message framing and sender status were not meaningful, independent of any potentially dampening ceiling effects. We found that participants rated the social worker significantly more moral and trustworthy than the state secretary. Even though other scholars found trustworthiness and morality to enhance the effect of health-promoting messages (Luttrell et al., 2019; Pagliaro et al., 2021), we could not see any difference between the message framing or sender groups.

We found that individuals high in trait autonomy tend to support the rules more consistently. In contrast, individuals low in trait autonomy tend to change their evaluations more in response to influence.

Article 3: Assessing Behavioral Autonomy in Resistance to Descriptive Norm Feedback

Zey, E., Schultze, M. & Windmann, S. (submitted). Assessing Behavioral Autonomy in Resistance to Descriptive Norm Feedback

Social norms contain vital information for humans about how one should behave or how others typically behave and were applied in conformity and compliance experiments (Cialdini & Goldstein, 2004). Therefore, we chose a descriptive social norm influence for the present studies to investigate the influence of descriptive norm feedback on changes in responses to factual items. As descriptive norm feedback, we showed participants a manipulated feedback distribution allegedly from a former study but actually based on the participant's initial answer in each trial. Furthermore, we operationalized reactive autonomy (Koestner & Losier, 1996) in terms of behavioral resistance to the influence of a descriptive norm showing manipulated feedback.

Similarly to Bostyn and Roets (2017) and Wijenayake et al. (2020), we used bogus feedback to operationalize the descriptive norm. However, in contrast to Bostyn and Roets (2017), we used a pre- and post-measurement to assess the within-person factor and a between-person comparison.

In a former study, we investigated the influence of message framing on reported social distancing behavior (Zey & Windmann, 2021). We observed that already morally established behavior is more challenging to influence than behavior discussed in an ambivalent way. According to Laporte et al. (2010) and Wijenayake et al. (2020), item difficulty and high uncertainty played an essential role in participants' compliance. Therefore, we selected 16 general knowledge (Liepmann et al., 2012) and ten spatial reasoning items (Raven, 2019) for the present studies based on item difficulty and participants' confidence of a preceding pilot study (N = 29). Additionally, Wijenayake et al. (2020) found that the tendency to conform to bogus feedback increased significantly when answering objective items. Thus, we used factual questions as stimulus material in this paradigm.

In the current studies, we consider not-changing from pre- to post-feedback responses a behavioral manifestation of reactive autonomy. Each trial in which a person changes their response after receiving feedback is considered a "shift" in response. As a result, we refer to people who change their responses at some point in the two task types as feedback shifters. On the other hand, non-shifters stick to their initial answers after receiving feedback. Hence we call them reactively autonomous. Additionally, we use the number of shifts as a gradual measure of reactive autonomy (a lower number of shifts is associated with higher autonomy).

In addition to the behavioral assessment of autonomy, we used self- and other-reliance scale, a self-developed short trait scale, as the self-report measure for reactive autonomy. Moreover, to explore the connection to reflective autonomy measures, we

also assessed autonomy-connectedness (Bekker & van Assen, 2006) and index autonomy functioning (Weinstein et al., 2012) in Study 2. Moreover, in Study 1, we assessed need for cognition (Epstein et al., 1996) and in Study 2, the Big Five (Borkenau & Ostendorf, 2008; McCrae & Costa, 2004).

First, we investigated whether self- and other-reliance can predict experimental autonomy. Next, we analyzed how situation-specific variables such as participants' initial confidence, the correctness of feedback, or task type affect the likelihood of shifting. Third, we examined how non-shifters differed from shifters. Finally, we analyzed the relationship between self- and other-reliance to the need for cognition in Study 1 and other autonomy scales and the Big Five in Study 2.

Method

First, we conducted an online panel study ($N = 392$) with age, gender, and education quotas, and second, an on-site laboratory study ($N = 93$). The procedure and analyses for Studies 1 and 2 are the same if not otherwise stated. In both studies, participants completed 26 trials of general knowledge and spatial reasoning items in a multiple-choice format in randomized order. They consisted of 16 *general knowledge* items and ten *spatial reasoning* items.

The general knowledge items were adapted from the IST 2000R (Liepmann et al., 2012). Each question The answer possibilities of each question ranged from a) to e), e.g., "To which country does Greenland belong?", "a) Canada," "b) Island," "c) Russia," "d) USA," or "e) Denmark." The ten spatial reasoning items were taken from Raven's Progressive Matrices 2 (Raven, 2019). Here also, each consisted of a multiple-choice format with answer possibilities ranging from "a)" to "e)."

In each trial, participants initially answered the question once at the 1st decision. Then, they saw feedback showing a bar graph distribution and made their 2nd choice, as illustrated in Figure 3. The bar graph allegedly showed other participants' responses (descriptive norm) from a prior study. In 50% of the trials, the participant's initial response represented the minority of choices. We refer to this as *incongruent* feedback. In the remaining 50% of trials, the participant's response represented the majority of responses (distractor trials). Hence these trials show *congruent* feedback.

Additionally, we measured the confidence about each response at both measurements (pre- and post-feedback). After the trials, we assessed self-reliance, other-reliance, and demographic questions. In Study 1, we also measured the need for cognition (Epstein et al., 1996). In contrast, in Study 2, we assessed autonomy-connectedness (Bekker & van Assen, 2006), index of autonomy functioning (Weinstein et al., 2012), and the Big Five using the German NEO - FFI questionnaire (Borkenau & Ostendorf, 2008; McCrae & Costa, 2004).

In both studies, we ran cross-classified models predicting the probability of shifting. We analyzed feedback correctness, initial correctness, and initial confidence at trial-

level, item-level, and person-level. Additionally, we had the type of task on the item-level while on the person-level, we also analyzed self- and other-reliance, age, gender, and education.

Figure 3

Example Trial of a General Knowledge Task at 1ˢᵗ Decision and followed by 2ⁿᵈ Decision with Feedback
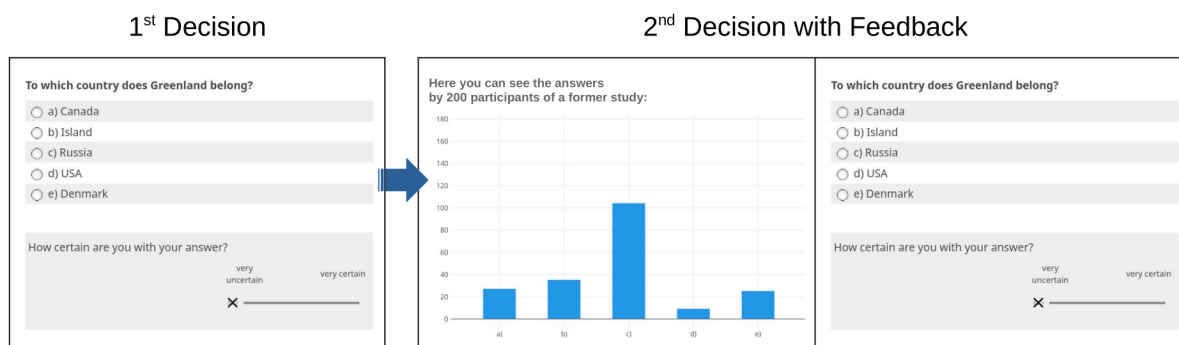
Note. In the 2ⁿᵈ decision with feedback, the bar distribution was displayed above the question.

Results and Discussion

Online and in the laboratory, participants shifted significantly more often when they received incongruent feedback relative to congruent feedback, see Figure 4. Additionally, the decision confidence decreased significantly from pre- to post-measurement when receiving incongruent feedback compared to congruent feedback.

Across both studies, we did not find a meaningful influence of self-reliance on the shifting probability. However, we found other-reliance to significantly increase the probability of shifting. Hence, the higher the other-reliance, the lower is the behavioral autonomy.

It is important to note that we repeated the analysis with $N = 285$ for the online study, excluding those who admitted to having looked up at least one of the questions, see Supplemental Materials. The main pattern of the results was the same as in the whole sample $N = 392$, except for other-reliance in cross-classified models predicting the probability of shifting. Interestingly, when excluding the data of the persons looking up questions, other-reliance is no longer meaningful for shifting, excluding those who do indeed behaviorally rely on others rather than on their own evaluation changes whether trait other-reliance significantly explains the variance of the shifting probability.

In both studies, the initial correctness and the initial confidence on trial-level significantly decreased the probability of shifting. Furthermore, the initial correctness was associated with a decreased probability of shifting largely on the person-level.

In Study 1, the correctness of the feedback was significantly associated with a decreased probability of shifting on the person-level, in contrast to Study 2, where this effect

Figure 4

Mean Percentage of Trials with 95% [CI] in which responding Shifted to another Option after the Feedback
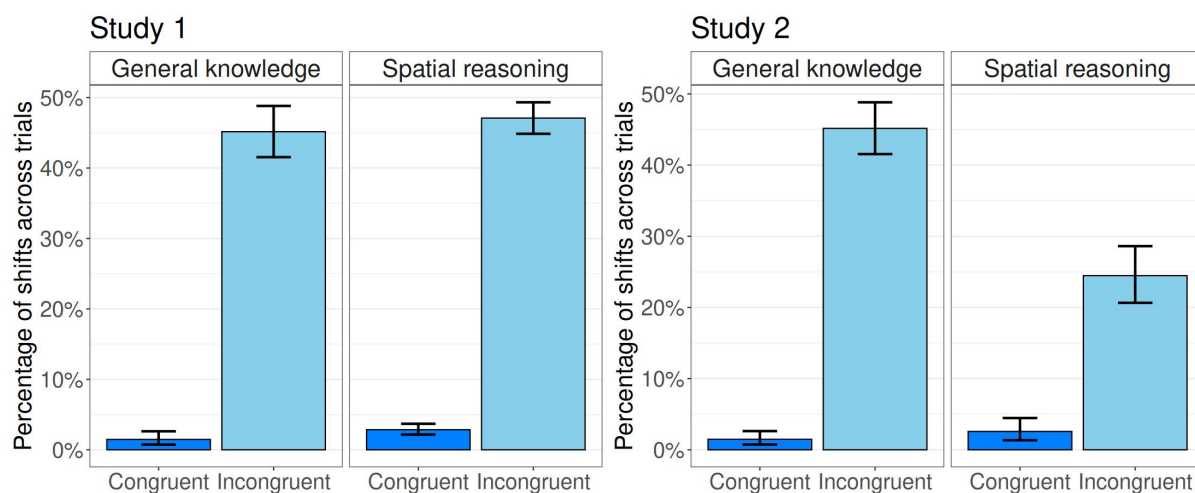
was not meaningful. Similarly, the initial confidence on the person-level is meaningful for the probability of shifting in Study 1 but not in Study 2. Previous studies (Laporte et al., 2010; Wijenayake et al., 2020) also reported participants' initial confidence indicative of compliance with the feedback.

Conversely, task type on the item-level indicates the shifting probability in Study 1, but it is not meaningful in Study 2. It also contradicts the pattern displayed in Figure 4, where participants in Study 1 shifted almost twice as often in the spatial reasoning task than in Study 2. Some differences between the two studies could be due to the different sample sizes, $N = 392$ versus $N = 93$. Replications are therefore necessary.

In Study 2, we analyzed the data of the non-shifters versus the shifters for the spatial reasoning task. We found that the non-shifters had reported significantly higher scores on self-reliance and self-awareness than the shifters. In addition, the scores of other-reliance and susceptibility to control are significantly lower for non-shifters than non-shifters. On the other hand, we found no significant differences between shifters and non-shifters regarding self- and other-reliance and the need for cognition. Thus, self-reliance and self-awareness should be considered positive factors, and other-reliance and susceptibility to control as negative factors for future attempts at autonomy operationalization.

Finally, we examined the relations of self- and other-reliance on other traits. We anticipated a link to the need for cognition since autonomy requires the ability and willingness to think for themselves. In Study 1, we discovered a small positive association $r = .20$, $p < .01$, between self-reliance ($M = 4.00$, $SD = 0.75$) and need for cognition ($M = 3.49$, $SD = 0.80$), as well as a slight negative association, $r = -.12$, $p < .01$, between

other-reliance ($M = 3.21$, $SD = 0.81$) and need for cognition. In Study 2, we analyzed the relationship between self- and other-reliance and personality traits. Table 5 displays the results.

Table 5

Correlations between the Reactive Measure Self- and Other-Reliance and the Reflective Measures Index of Autonomy Functioning (IAF) and Autonomy-Connectedness (ACS)

	M	SD	N	1	2
1.Self-reliance	3.87	0.77	94		
2.Other-reliance	3.60	0.74	94	-.09(.01)	
IAF					
3.Authorship/self-congruence	3.87	0.54	94	.32(.01)	-.18(.23)
4.Susceptibility to control	2.74	0.78	94	-.16(.25)	.40(<.01)
5.Dispositional autonomy	3.33	0.42	94	.23(.13)	-.30(.02)
ACS					
6.Self-awareness	3.18	0.48	53	.43(.01)	-.30(.16)
7.Sensitivity to others	2.75	0.83	53	-.39(.03)	.25(.30)
8.Capacity for managing new situations	3.05	0.70	53	.31(.14)	-.21(.42)

Note. N varies for the ACS Scale. *p*-values are adjusted for multiple testing with Holm correction.

We investigated the influence of descriptive norm feedback on changes in responses to factual items. Furthermore, cross-classified multilevel models in both studies discovered that on the trial level, the initial correctness of participants' initial responses and their initial confidence decreased the probability of shifting. The same is true for initial correctness at the person-level. As expected, in both studies, other-reliance increased the likelihood of shifting. However, in the online study, other-reliance was only meaningful for the probability of shifting when we included participants who admitted looking up the correct answers in the analyses. Hence, coincidentally, we found that the persons who behaviorally rely on others also are essential for the effect of other-reliance on the probability of shifting. Non-shifters, or reactively autonomous individuals, showed no significant differences in self-reliance, other-reliance, or need for cognition compared to the shifters in Study 1. In Study 2, however, we discovered that non-shifters had significantly higher scores in self-reliance and self-awareness and significantly lower scores in other-reliance and susceptibility to control than the shifters on the spatial reasoning task. As expected, self-reliance was positively correlated with authorship/self-congruence and self-awareness and negatively correlated with sensitivity to others. In contrast, other-reliance was negatively correlated with the index of autonomy functioning scale and the susceptibility to control sub-scale. The findings reinforce that self- and other-reliance could be relevant autonomy factors and that reactive and reflective autonomy are nonetheless related.

3 General Discussion

In the following, we will shortly discuss the main findings of the three empirical articles: laypersons' and scholarly perspectives on autonomy, autonomy in resisting message framing and sender authority, and autonomy in resisting descriptive norm feedback. Next, we will draw conclusions for the general behavioral assessment of reactive autonomy, followed by a summary of the indications for an autonomous personality. Then, we will examine the limitations and strengths of our approaches. Finally, after discussing broader aspects and implications for autonomy, we end with an overall conclusion.

Laypersons' and Scholarly Perspective on Autonomy

We used a bottom-up approach to compare scientific characteristics with laypersons' views in three sequential studies. First, we identified five components of autonomy in the literature: dignity, independence, morality, self-awareness, and unconventionality. Then, we examined how laypersons exemplify autonomy, what behaviors they perceive as more or less autonomous, and whether this is consistent with the autonomy characteristics found in the literature.

Laypersons' view on autonomy

Here we conducted a series of three consecutive studies: In the first study, participants named 807 examples of autonomous behavior. The examples ranged from specific examples (e.g., choosing what to wear) to rather abstract terms (e.g., thinking critically). We sorted the examples into 34 categories, the subsequent items in Study 2. Here, the participants rated the categories regarding their autonomy. The five high autonomy items focused on relationships/attachment and reflected thinking, whereas the low autonomy items were rather diverse in topics. What all low autonomy items had in common was a rather egoistic valence, whereas the high autonomy items all had a positive and moral valence to them.

Hence, we conclude, perceived morality plays a massive role for laypersons. Behaviors are only judged as highly autonomous if they are also highly moral and vice versa. The concept of moral autonomy coined by Kant also appears to be rooted in the thinking of laypersons. SDT coins the term of *whole-heartedness* for autonomous actions deriving from oneself (Koestner & Holding, 2021). This whole-heartedness could also be what feels so moral for the laypersons because it is intrinsically the right thing to do. In addition, according to Oshana (2006) , moral autonomy refers to the relationship a person has with a system of moral moral norms. Being morally autonomous involves reflecting on one's own principles and not does not accept the moral judgements of others without critical and independent scrutiny (Oshana, 2006). Considering these aspects, we conclude that morality is a fundamental characteristic of autonomy.

The Relationship between the Laypersons' Perspective and the Scientific Components

We found the proposed interaction between the autonomy level and the compo-

nents. The participants rated behaviors characterized by high autonomy significantly higher in their perceived dignity, independence from others, morality, and self-awareness than behaviors low in autonomy. These four components also showed a moderately high intercorrelation in their ratings, indicating that participants see them as related.

On the contrary, we identified a reverse effect for the fifth component: the high-autonomy items were viewed as less unconventional, and the low-autonomy items were rated as more unconventional. This reverse effect was surprising since two participants had already named examples of unconventionality in the first study. We assume that the negative phrasing of the term and the contrast to the moral connotation of the high autonomy items contributed to this reverse finding.

Interestingly, we also found examples representing autonomy as independence, in a reactive manner, and autonomy as self-governing, in a reflective manner: some examples are close to common definitions, e.g., "acting uninfluenced by external factors," and others listed "independence" as an abstract example. On the contrary, how we shape interpersonal relationships, hence the interdependent or connectedness part of autonomy, is resembled in many other examples, e.g., "choosing with whom one surrounds oneself."

We found remarkable similarities between laypersons' understanding of autonomy with the scientific view of autonomy. However, the deeper qualitative look into the results also illustrated differences between the participants in what they see as autonomous examples and how others evaluate this later. The intermingled findings also reflect the scientific controversies stated in the theoretical background above (autonomy as independence versus autonomy as self-governance).

Autonomy in Resisting Message Framing and Sender Authority

In this second article, we asked whether authoritarian/controlling message framing is more effective than moralizing/prosocial or neutral message framing. In doing so, we also modulated the authority of the sender: the social media message was authored by either a sender with high authority (secretary of state) or a sender with low authority (social worker). We were particularly interested in whether recipients' self-assessed autonomy could lessen these effects.

Influence of Message Framing and Sender Authority

The effects of message framing and sender status were insignificant regardless of potentially moderating ceiling effects. We found that participants rated the social worker as significantly more moral and trustworthy than the secretary of state. Although other researchers have found that trustworthiness and morality enhance the impact of pro-health messages during the pandemic (Luttrell et al., 2019; Pagliaro et al., 2021), we found no difference between the groups. This is likely also due to the overall ceiling effects in the social distancing items.

Our results suggest that social distancing rules against the spread of COVID-

19 were generally well-supported at the time. Self-assessed adherence to the rules was already high before the manipulation. Nevertheless, the social media tweet increased this agreement with the rules across all message framing and both senders. For the item with the highest uncertainty at the time (wearing face masks) we found greater deviations after the manipulation. Thus, influencing public health communication via social media might work more effectively when there is more uncertainty about how effective the controlled behavior will be.

Experimental Autonomy (Not-Shifting) and Self-Reported Autonomy

Across all groups, absolute differences before and after the intervention correlated slightly negatively with self-reported autonomy: the higher participants' autonomy, the less they changed their decisions between the two assessment measures. We also found that individuals with high trait autonomy supported the rules more consistently. In contrast, individuals with low trait autonomy tended to change their ratings more in response to being influenced. Individuals with low autonomy changed their ratings more than those with high autonomy. Interestingly, these shifts are in both directions for the low autonomous, i.e., following and rejecting the message. Low self-reported autonomy may thus not only lead to a deflection in a specific intended direction. Instead, the persons with low self-reported autonomy seem more insecure in their position.

The results obtained with singular analyses of the item about wearing a mask suggest that health communication is receptive, especially in uncertainty. Therefore, future research should focus on measures mandated by authorities and measures about which people may still be uncertain. Furthermore, health communication should start immediately on new topics, e.g., explaining a newly discovered therapy, to pick up uncertain people directly.

In particular, people with low autonomy may find it difficult to form and express an opinion if it is directed against already implemented regulatory directives. This aligns with previous decision-making research findings (Laporte et al., 2010; Wijenayake et al., 2020) that uncertainty and ambiguity reinforce the person-specific component of the decision-making process.

Autonomy in Resisting Descriptive Norm Feedback

The influence of manipulated feedback using a descriptive norm on changes in responses to factual items was examined online and in the laboratory. In doing so, we operationalized reactive autonomy in terms of behavioral resistance to the influence of the descriptive norm. We also examined whether the self-developed short self-report scale, which measures self- and other-reliance, could predict the likelihood of exhibiting such behavioral resistance.

Experimental Autonomy (Not-Shifting) and Self-Reported Self- and Other-Reliance

In both studies, as other-reliance increased, the likelihood of shifting increased. However, in the online study, other-reliance was only meaningfully related to the probability of shifting when we included participants in the analyses who admitted to looking up the correct answers on the internet. Thus, we found that the persons who behaviorally rely on others also are essential for the effect of other-reliance on the probability of shifting.

Experimental Autonomy (Not-Shifting) and Situation-Specific Variables

As expected, participants in both studies shifted significantly more often when getting feedback incongruent to their initial answer than when getting congruent feedback. Overall, the correctness of participants' initial responses and their initial confidence decreased the probability of shifting.

In the online study, the factual correctness of the feedback also increased the probability of shifting. Hence, it is crucial to determine how realistic or accurate the feedback is. Conversely, in the online study, the task types had different overall shifting probabilities on item level, but not in the laboratory study. The main pattern was the same in the laboratory study, but some inconsistencies occurred, which could be due to the relatively small sample size in this study ($N = 93$).

Differences between Non-Shifters and Shifters

Overall, there were few non-shifters or reactively autonomous individuals. In the online study we found no significant differences in self-reliance, other-reliance, or need for cognition comparing the non-shifters and the shifters. In the laboratory study, though, we discovered that non-shifters had significantly higher scores in self-reliance and self-awareness and significantly lower scores in other-reliance and susceptibility to control than the shifters on the spatial reasoning task. This gives essential indications for a reactively autonomous personality.

The Relation of Self- and Other-Reliance to Index of Autonomy Functioning and Autonomy-Connectedness

Next, we looked into the trait characteristics underlying the reactively autonomous behavior in our experimental setting. We expected self-reliance to predict reactive autonomy positively. Thus, we presumed an inverse relationship between self-reliance and response shifting. However, we did not find any meaningful association in cross-classified models predicting the probability of shifting. Nevertheless, we found other-reliance to significantly increase the likelihood of shifting across both studies. Hence, the higher the other-reliance, the lower the reactive behavioral autonomy. In other words, the more individuals self-report the tendency to rely on others in their decision-making, the more they proved susceptible to the influence of the descriptive norm in our experimental setting.

As expected, self-reliance was positively correlated with authorship/self-congruence and self-awareness and negatively correlated with sensitivity to others. In contrast, other-

reliance was negatively correlated with the index of autonomy functioning scale and the susceptibility to control sub-scale. The findings reinforce that self- and other-reliance could be relevant autonomy factors and that reactive and reflective autonomy are nonetheless related.

Behavioral Assessment of Autonomy

For the behavioral assessment of autonomy, it is essential to distinguish (situational) reactive autonomy from (intrapersonal) reflective autonomy. We can assess reactive autonomy between persons and in concrete standardized situations. Measuring reflective autonomy requires a focus on the motivations and intrinsic thinking underlying the action. In this work, we have presented two paradigms for the experimental measurement of reactive autonomy. In summary, we derive the following points.

A degree of uncertainty or missing confidence makes autonomous behavior less likely. When persons already had preformed their opinion, as with social distancing at the beginning of the pandemic, it was more challenging to influence them overall. The analysis of the item about wearing masks with the high uncertainty at the time perfectly illustrates this point. Here, the participants had ambiguous information from news reports and media at the time. Thus, they were more uncertain, and the message had greater power to influence them.

Additionally, the participants' confidence also influenced the probability of shifting after the descriptive norm feedback, in line with previous findings where participants showed more compliance under uncertainty (Laporte et al., 2010; Wijenayake et al., 2020). This also corresponds to the research by Asch (1961), where participants responded to factual vision tasks in the presence of confederates. In the experiment by Milgram (1974), situational factors and the experimental setting were so intimidating, and the position was so new that participants were overwhelmed by the situation. Swann and Jetten (2017) also argue that strong situational pressures lead participants to abandon their principles or disregard their perception. In real life, the situations where autonomy is most required often involve tremendous external pressures. To resist them, a strong value foundation is needed. A point of reference for strengthening autonomy could be in reducing uncertainty. For example, the methods of Barden and Petty (2008) can help people feel more knowledgeable in their attitudes. Nevertheless, being aware of one's moral grounds and values helps to prepare for situation-specific factors that foster conformity and remain autonomous.

In Article 2, we demonstrated that experimental deflection is particularly difficult when participants already have a established opinion. Beyond that, in another study we conducted with a pre-/post-measurement design with a descriptive norm influence, we had the same difficulties in the experimental manipulation. There we applied a feedback distribution of an allegedly former study on moral dilemma questions like medically

assisted suicide. We found that most people stuck to their answer when they had a pre-formed opinion or value set behind it. So, reactively, they were very autonomous, but we do not know what motivated them to stick to their opinion. For example, people might be wholeheartedly convinced, based on their personal history, that assisted suicide is a necessary last resort to prevent long suffering. This would be just as reflectively autonomous as reactively autonomous. Conversely, they could be members of a religious community that strictly forbids suicide and therefore feel compelled to respond accordingly, which would be reactively autonomous but not in accordance with their intrinsic values and therefore not reflectively autonomous.

Notably, within this work, we had a mere focus on reactive autonomy. To our knowledge, reflective autonomy has not yet been experimentally assessed. Future studies should particularly examine the motivations for moral answers and whether they can be considered autonomous requiring more qualitative research on behavioral autonomy. Therefore, diary studies and longitudinal data on how persons determine their life course would be insightful.

In both articles, we found an indication of a relationship between the self-report measures we used for reactive autonomy and the shifting behavior. As predicted, the self-reported autonomy in Article 2 was negatively associated with the shifting. Moreover, in Article 3, other-reliance significantly increased the probability of shifting across both studies. Coincidentally, we also found that individuals who behaviorally relied on others were also essential to the effect of other-reliance on the probability of shifting. This indicates that cheating or looking up instead of relying on one's own thoughts could also contribute to a further operationalization. The parallel to Asch's line experiment, in which participants also just looked up others, is also evident here (Asch, 1961). In a future experimental setting, participants could have the options of seeking help or relying on their own initial decision. This would have the disadvantage that not all of them would see the manipulation, but precisely those who forgo help can be considered reactively autonomous.

It is particularly important to rule out reactance effects to assess reactive autonomy. In addition to the ceiling effects in Article 2, we may have had the additional problem of triggering reactance in this study. The authoritarian/controlling condition, in particular, used controlling language. Messages are perceived as controlling, including a commanding tone, such as "must," "ought," and "should" (Miller et al., 2007, p.223). Whereas autonomy-supportive language rather gives an opportunity like, e.g., "perhaps," "possibly," and "maybe" (Miller et al., 2007, p.223). The controlling language might have caused a reactant response to the messages, which could have caused increased message rejection and source derogation (Miller et al., 2007). For example, Quick and Kim (2009) found a significant positive association between a perceived freedom threat and reactance for South Korean adolescents in line with psychological reactance theory (Miron & Brehm,

2006). Based on Self-Determination and Psychological Reactance Theory, Wilbur et al. (2021) compared two counter-propaganda strategies for boosting peoples' resistance to extremist propaganda. Compared to the control condition, both manipulations resulted in a lower agreement with extremist messages. The effects of autonomy and reactance support were both mediated by felt autonomy need-satisfaction but not by state reactance. Interestingly, telling participants that they are free to accept extremist claims may, ironically, help them resist such claims (Wilbur et al., 2021). What we can draw from this and reactance research is the relevance of autonomy-supportive language as opposed to controlling language (Rosenberg & Siegel, 2018).

Indications for an Autonomous Personality

For the behavioral measurement of autonomy, we have determined that a clear distinction between situational reactive autonomy and the intrapersonal concept of reflective autonomy is essential. This distinction is equally necessary when speaking of an autonomous personality. In the following section, we will explain how we arrived at this conclusion, based on our results.

We operationalized reactive autonomy using the self- and other-reliance scales. Notably, other-reliance was found to be associated with a higher probability of response change. This observation establishes a link between self-report and observed behavior. Moreover, the relationship between other-reliance and solution seeking also impacted the observed shifting behavior. Consequently, the level of behavior, particularly other-reliance, is a significant negative factor for autonomy.

We also examined the relationsship between self- and other-reliance and scales measuring reflective autonomy. Consistent with our expectations, we found that self-reliance was significantly positively correlated with authorship/self-congruence, a sub-scale of the IAF, and self-awareness, a sub-scale of the ACS. This implies, that self-awareness also appears to be a component of autonomy in self-report. Additionally, self-awareness was recognized as an essential component of autonomy for both laypersons and in the existing literature. Therefore, it is advisable for future research to include self-awareness in its concept of autonomy.

In contrast, self-reliance was negatively correlated to the sensitivity to others scale (ACS sub-scale). This finding aligns with our preregistration and highlights the difference between the reactive conceptualization of self- and other-reliance and the reflective measure of autonomy-connectedness. While sensitivity to others is essential in the reflective definition of autonomy, the sub-scale negatively correlates with the reactive factor self-reliance.

Other-reliance was negatively associated with susceptibility to control (IAF sub-scale). Furthermore, other-reliance correlated with susceptibility to control, which shows the common ground between the reactive and the reflective autonomy understanding:

influence or control from the outside is a negative factor in both.

We identified a small positive relationship between the need for cognition and self-reliance, and a slightly negative relationship with other-reliance. This is consistent with our assumption that autonomy requires the ability and willingness to think for oneself. It also aligns with the idea that to be autonomous, an individual must possess the cognitive capacity to differentiate between right and wrong and engage in self-reflection (Bublitz & Merkel, 2009).

Therefore, self- and other-reliance serve as a good starting point for further measures of reactive autonomy. Contrary to the findings of Koestner and Losier (1996), we could not find meaningful associations between the Big Five and self- and other-reliance. A closer examination of the non-shifters, provided further indications for reactively autonomous characteristics. Non-shifters exhibited higher levels of self-reliance and self-awareness compared to shifters. At the same time, their scores in other-reliance and susceptibility to control were significantly lower than those of the shifters.

Our findings provide a more nuanced picture of the components relevant to reactive autonomy, characterizing autonomous individuals as rational and less susceptible to control. In a reactive concept, highly autonomous individuals also demonstrate heightened sensitivity to their own role compared to others, which is nevertheless associated with self-reliance.

The comparison of autonomy characteristics between laypersons and scientific literature, and the study on social distancing behaviors showed the unique link of morality to autonomy. This connection may be influenced by the profound imprint of Kantian moral autonomy, both in layperson beliefs and academic discourse. Nevertheless, we aim to discuss this link further.

If laypersons tend to regard actions aligned with moral principles as indicative of exceptional autonomy, and those with more selfish or less moral connotations as less autonomous, it raises the question: Is morality a prerequisite for autonomy, or is it the other way around? Both aspects have validity. To act according to one's values, one needs to be aware of these values and possess an intrinsic moral compass or value system. Secondly, what value would a moral act have if the person initiating it is not autonomous? Thus, we conclude that the congruence between morality and autonomy is essential.

Strengths and Limitations

One of the major strengths of this dissertation may lie in its novel approach to measuring reactive autonomy. By combining experimental measurement with self-reports, it entails the advantage of a direct comparison between actual behavior and self-assessment. Moreover, comparing the behavioral measure with the self-reports allows us to analyze the congruence between the two - whether individuals who report in self-assessments exhibit exhibit actual corresponding behavior in experiments.

Secondly, we employed different methodological approaches. In Article 1, we used a semi-qualitative bottom-up approach, whereas, in Articles 2 and 3, we conducted quantitative studies in an experimental setting. Finally, to control for online study-specific effects (e.g., disturbances or cheating in responding to the factual questions), we replicated our paradigm in the laboratory. This ensures the stability of the effects in Article 3 in both online and on-site environments.

Compared to other studies, like Bostyn and Roets (2017), we introduced a within-factor to the behavioral measurement: repeated measures in a pre-and post-measurement design. This allowed us to compare initial and manipulated responses. It also enabled us to account for shifts in each person since we assessed both pre- and post-responses for each individual at multiple measurements. Additionally, we analyzed and ruled out item-specific effects.

However, it is important to note that our focus within the behavioral measure was solely on reactive autonomy, but not on reflective autonomy. Reflectively autonomous actions are those that individuals "may do" and not those that one "must do." Lastly, autonomous goals are pursued wholeheartedly and not half-heartedly (Koestner & Holding, 2021). To identify motives or actions stemming from reflective autonomy, it is essential to know the underlying motives. These can be captured, for example, by asking people whether they engage in certain activities out of interest and appreciation or due to internal or external pressures.

The findings of these studies may inform the design and interpretation of psychological surveys and experiments on autonomy. The wide range of examples provided by the laypersons in Article 1 could be used as a basis for item development. Additionally, based on the frequency of topics in these examples, factors for autonomy could be derived using a bottom-up approach. These real-life, specific examples provide an opportunity to capture autonomy at the behavioral level beyond the laboratory and self-report. Here, comparing concrete behavior in the field and self-assessment is particularly interesting. Future research could also explore differences between intention and behavior, as well as implicit and explicit motives, which can influence behavior according to Ryan and Deci (2006). An other idea worth considering is the use of an implicit measure of autonomy by adapting the knowledge from Implicit Association Test (Greenwald et al., 1998, 2003). This would enable correlations with parallel autonomy self-report measures and considering the knowledge of the situational factors from Articles 2 and 3.

Furthermore, it is imaginable to derive behavioral measures of autonomy based on the examples provided in Article 1 and use these for further experimental investigation. Participants frequently mentioned critical life situations or decisions such as career choice, educational path, or partner choice. Especially in these transition phases, autonomy is essential for laypersons. Thus, conducting ambulatory assessments or diary studies could provide valuable insights into autonomy-sensitive phases from a longitudinal perspective.

Furthermore, investigating autonomy over a lifetime, for example, using Life Story Interviews (Atkinson, 1998; Turner et al., 2021), would be an interesting avenue for future research.

Importantly, we need to address limitations regarding the generalizability of the findings. The samples in Article 1 are primarily composed of student recruitment and social media advertisements. While we deliberately excluded psychology students, we cannot entirely rule out the possibility of participants with prior knowledge of autonomy. Moreover, the samples in Article 1 were generally more highly educated than the average German population, which might have introduced bias.

Additionally, studies 1 and 2 of Article 1 show a substantial overrepresentation of female participants. In study 2, we checked for gender differences between male and female participants and found no meaningful deviations, but non-binary and male voices are underrepresented. In Article 2, the sample consists of n = 300 persons recruited by a panel and quoted in age, gender, and education and an other n = 407 persons who participated through personal social media advertisements. In the latter part of the sample the female participants are again overrepresented. This gender imbalance could potentially impact how autonomy is perceived, particularly considering differences in socialization between genders. For example, Blatt (2004) and Luyten et al. (2007) argue that Western societies appreciate autonomy and self-definition in men, whereas relatedness and attachment are typically more valued in women. Accordingly, women in Western societies have higher levels of dependency while men score higher on self-criticism (Besser & Blatt, 2007; Blatt, 2004). Blatt (2004) thinks that gender incongruence, in both directions, e.g., men with high dependency and women with high self-criticism, might even increase the risk for depression and other disorders. On the questionnaire level, using the autonomy-connectedness scale is one step to consider gender-specific differences in autonomy (Bekker, 1993; Bekker & van Assen, 2006). Addressing these gender-specific differences is an important step for future research, including all genders.

In Article 3, we used quoted online panel data in Study 1. However, in study 2, in the laboratory, the sample is highly educated, rather young, and about two-thirds of the participants are female. In this context, the shift rates deviated for the spatial reasoning task, potentially attributable to age effects. The younger individuals in this sample are likely to have benefited from a more open and progressive education which encourages the eductive ability needed to solve the spatial reasoning tasks (Nickerson et al., 2013; Raven, 2000). Interestingly, the result patterns in the cross-classified models in Article 3 show similar patterns, and there is no primary indication of gender or education effects. Nevertheless, to assess the generalizability of our findings more comprehensively, replications with more diverse samples that better represent marginalized groups are essential.

One major limitation of this research is that all the studies were conducted within

the German population, and they predominantly involved highly educated individuals. Consequently, all present samples align with the so-called Western, educated, industrialized, rich, and democratic (WEIRD) criteria (Henrich et al., 2010), further increasing the existing bias in the social sciences. This is particularly noteworthy in the context of a topic like autonomy, which continually seeks to balance individuality and relationships, as cultural factors and socialization can significantly influence perceptions of autonomy. The debate about the universality of the pursuit of personal autonomy remains very controversial. On the one hand, universalists claim that the need for autonomy is innate to human nature and essential for well-being. On the other hand, relativists argue that the need is a socio-cultural constructed and rooted in individualistic cultural values (Li et al., 2022). Some research findings indicate cultural differences in autonomy-connectedness (Moleiro et al., 2017). Chirkov (2008) argues that autonomy, in the SDT sense as an endorsement of an individual's action, is a universal phenomenon. While the value placed on autonomy may differ across societies, its fundamental role is considered universal (Chirkov, 2008).

Conversely, Li et al. (2022) examined the moderating role of the cultural dimension of individualism-collectivism on autonomy with large-scale data ($n = 247{,}417$). They found that autonomy was consistently associated with higher subjective well-being, and this link was moderated by individualism-collectivism. Furthermore, the link between autonomy and subjective well-being was weaker in collectivistic societies compared to individualistic societies. Therefore, we assume that culture very likely influences autonomy. Therefore, the results are difficult to generalize, and cross-cultural replications should confirm the effects beyond WEIRD societies.

Broader Aspects and Implications

Autonomy has been a topic of recent political debate, particularly in the face of the challenges of a global pandemic. To some extent, people's autonomy has been restricted by the state. However, the terms autonomy and freedom have often been misused and misapplied. For example, people in Germany felt that their autonomy or freedom was restricted because they had to wear masks in closed public spaces, such as hospitals, to protect others. This resistance to wearing masks in public can be described as reactance rather than autonomy. Reactance comes into play when people see their behavioral freedom threatened and they react with strong arousal to restore that freedom (Miron & Brehm, 2006; Rosenberg & Siegel, 2018). It is important to note that the reasons for refusing to wear a mask "could be confused with autonomy" (Koestner & Holding, 2021, p.3). The refusers are not necessarily in line with "their volition, but rather they are behaving in line with controlling group norms or personal introjections" (Koestner & Holding, 2021, p.3).

Nonetheless, not all persons wearing a mask necessarily do so autonomously. While some do so wholeheartedly, others blindly follow the rules or authorities. The example

illustrates the importance of the motivation behind the action and how autonomy is intertwined with our interactions with others, rather than existing solely in separation from others. A broader understanding of autonomy, which does not confuse autonomy with reactance, can contribute to finding a shared, participatory, and proactive solution in public discourse for the benefit of all, with the greatest possible autonomy for everyone within democratic limitations. Autonomy, in the sense of Mill (1966), is the the self-determined pursuit of one's own well-being, as long as freedoms of others remain untouched.

Autonomy as self-control goes beyond separation and egoism but has a relational aspect to is. Ideally, these two aspects are congruent. Examining various types of psychopathology reveals disturbances in autonomy. Moreover, controlling social contexts play an etiological role in their development (Ryan & Deci, 2006). From a cognitive-behavioral perspective, scholars distinguished between sociotropy and autonomy as cognitive-affective personality styles that entail vulnerability to depression (Bieling et al., 2000). On a descriptive level, sociotropy-autonomy shows many similarities with Blatt's concepts of dependency and self-criticism, respectively (Blatt, 2004; Blatt & Luyten, 2009). In the two polarities model explained above, psychopathology emerges from an imbalance between relatedness/attachment and self-definition/autonomy (Blatt & Luyten, 2009; Luyten et al., 2007), which also accords to the theory of sociotrophy and autonomy. The "pathologies of autonomy confirm that autonomy is indeed more than an irrelevant illusion and, instead, is a central characteristic of healthy functioning" (Ryan & Deci, 2006, p.1565). Thus, fostering healthy autonomy is also crucial in psycho-therapeutic settings and prevention.

In everyday life, social control is omnipresent. Humans face controlling situations from a young age: teachers use methods that can undermine intrinsic motivation, e.g., grades and detention(Niemiec & Ryan, 2009). To influence students' behavior, praise and humiliation in front of the class can have a controlling effect (Niemiec & Ryan, 2009). Moreover, evidence suggests that teachers' support of students' basic psychological needs for autonomy, competence, and connectedness facilitates students' autonomous self-regulation of learning, academic achievement, and well-being. In work contexts, similar dynamics for motivation are evident (Gagné & Bhave, 2011; Zhao et al., 2022). In SDT, implications for both instructional practice and educational reform policy are discussed (Ryan & Deci, 2006). What we can draw from this, and from reactance research is the importance of autonomy-supportive language as opposed to controlling language (Rosenberg & Siegel, 2018). Autonomy-supportive language should be used to promote autonomy not only in motivation in school or work contexts, but also in clinical or therapeutic contexts.

Much of what we have discussed is a privileged discourse that assumes a mature, rational person and an able-bodied perspective. We think of autonomous persons who rationally decide to pursue happiness and success (Chirkov, 2011; Oshana, 2006). How-

ever, not all people are legally granted this right to make all decisions for themselves or have the bodily capabilities to do so on their own. Autonomy is often a major challenge for persons with physical and mental disabilities. Moreover, even if deciding for oneself, this foremost means asking others for assistance in certain life circumstances. Using personal case studies of adolescents with disabilities, A. Mill et al. (2010) illustrated how autonomy could be negotiated within one's own family. Autonomy is primarily a topic for those for whom autonomy is not a matter of course in everyday life. Future research should also look specifically at the role of autonomy in the lives of people with disabilities, older adults, or people with arrow needs, especially since autonomy is also a significant factor in patient dignity (Randers & Mattiasson, 2004; Sherwin & Winsby, 2011).

Conclusion

In this thesis, we provided implications for a better understanding of reactive and reflective autonomy considering the laypersons' understanding of autonomy and the behavioral measurement of reactive autonomy. Furthermore, self- and other-reliance can serve as a foundation for a self-report measure of reactive autonomy.

Our research highlighted how laypersons exemplified autonomous behavior and emphasized the qualities dignity, independence from others, morality, and self-awareness as characteristics of autonomy through a laypersons' and an empirical perspective. These characteristics provide a valuable perspective on the distinction between reactive autonomy, which involves independence from others, and reflective autonomy, which focuses on self-governance; both findings are also consistent with existing literature.

We also used two paradigms to measure behavioral autonomy, resistance to message framing and resistance to descriptive norm feedback. Both paradigms were found to be associated to the self-report measures of reactive autonomy: resistance to message framing exhibited a positive correlation with self-reported trait autonomy, while other-reliance was identified as a negative predictor of resistance to descriptive norm feedback.

Our results provide a concise portrayal of relevant characteristics for reactive autonomy: individuals acting in a reactively autonomous manner had a higher need for cognition and were less susceptible to control. In the context of a reactive autonomy framework, highly autonomous individuals also exhibited to be less sensitive to their role compared to others, a trait strongly associated with self-reliance. Other-reliance, on the contrary, was directly associated with an increased probability of shifting, negatively affecting experimental autonomy. The constructs of reactive and reflective autonomy may optionally be related in self-reports, but they have one thing in common beyond that: they resist more strongly to external influence or control. However, to avoid ambiguity of the term, it is essential to distinguish between the two when assessing autonomy in behavior and self-reports.

This work has proposed two distinct approaches to experimentally measure reactive autonomy and has outlined future directions for the development of trait measures for both reactive and reflective autonomy. In this regard, our findings contribute to a more practical understanding of autonomy, along with its behavioral implications and the characteristics associated with reactive and reflective autonomy.

4 Original Articles

Article 1: Grassroots Autonomy: A Laypersons' Perspective on Autonomy

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Grassroots Autonomy: A Laypersons' Perspective on Autonomy

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In the age of artificial intelligence, the common interest in human autonomy is experiencing a revival. Autonomy has formerly and mostly been investigated from a theoretical scientific perspective, in which scholars from various disciplines have linked autonomy with the concepts of dignity, independence from others, morality, self-awareness, and unconventionality. In a series of three semi-qualitative, preregistered online studies (total $N = 505$), we investigated laypersons' understanding of autonomy with a bottom-up procedure to find out how far lay intuition is consistent with scientific theory. First, in Study 1, participants ($n = 222$) provided us with at least three and up to 10 examples of autonomous behaviors, for a total of 807 meaningful examples. With the help of blinded research assistants, we sorted the obtained examples into categories, from which we generated 34 representative items for the following studies. Next, in Study 2, we asked a new sample of participants ($n = 108$) to rate the degree of autonomy reflected in each of these 34 items. Last, we presented the five highest-rated and the five lowest-rated items to the participants of Study 3 ($n = 175$), whom we asked to evaluate how strongly they represented the components of autonomy: dignity, independence from others, morality, self-awareness, and unconventionality. We identified that dignity, independence from others, morality, and self-awareness significantly distinguished between high- and low-autonomy items, implying that high autonomy items were rated higher on dignity, independence from others, morality, and self-awareness than low autonomy items, but unconventionality did not. Our findings contribute to both our understanding of autonomous behaviors and connecting lay intuition with scientific theory.

Keywords: autonomy, bottom-up process, dignity, independence, morality, self-awareness, unconventionality

INTRODUCTION

Autonomy (Greek αυτόνομος: "auto" means self and "nomos" means law) is a highly discussed concept in philosophy, education, psychology, medicine, rehabilitation, law, artificial intelligence, and other applied sciences. It is seen as an essential component of human life and a key democratic requirement, for example in Rousseau's political philosophy (Cohen, 1986). But despite its popularity, the meaning of the term is vague (Anderson et al., 1994), and regardless of its frequent use, there is little communication between scholars and the general public regarding the understanding of the concept. For instance, in constitutional law, autonomy is defined as "the condition in which what one does reflects who one is" (Weinrib, 2019), whereas psychologists say

that autonomous individuals "establish in a self-determined fashion their own life goals, criteria for their happy and good lives, and the moral standards, which they rationally decide to pursue to be happy and successful" (Chirkov, 2011, p. 611). Interestingly, both the Greek philosopher Aristotle and the psychological Social Determination Theory (SDT) define autonomy as self-rule or self-government (Ryan and Deci, 2006; Pérez and Ziemke, 2007). These various attempts at defining autonomy show how abstract and difficult it is to operationalize the term (Keenan, 1999). Indeed, several scholars demand specification of the concept of autonomy beyond theory and in the light of real-world implications and usability (Keenan, 1999; Racine et al., 2021). In the past, especially in the psychological literature, the focus lay more on the opposites of autonomy, in connection with conformity, compliance, and the bystander effect (Asch, 1961; Cialdini and Goldstein, 2004; Kundu and Cummins, 2013; Bostyn and Roets, 2017). By contrast, research on dissidence, deviance, or resistance, for which autonomy appears to be a prerequisite, is underrepresented (Swann and Jetten, 2017). Understanding what autonomy means from an applied everyday perspective could aid in setting up psychological surveys and experiments as well as interpreting their outcomes, in addition to improving the communication of its scientific conceptualization to the public.

Reviewing the scientific, philosophical, and psychological literature, we find five components that are repeatedly linked with autonomy. The first is dignity, referring to the most abstract principle regulating the relationship between the rulers and the ruled. Dignity is often equated with the concept of autonomy (Weinrib, 2019). It connects with autonomy in the domains of constitutional law and human rights (Sensen, 2011; Mahlmann, 2012), but also in health care and nursing (Fisher and Oransky, 2008; Delmar, 2013). In philosophy, the conception of autonomy is substantially influenced by Immanuel Kant (May, 1994; Taylor, 2005). According to Kant, a person's dignity emerges from being their moral lawgiver, i.e., from being autonomous (Kant, 1870). This standpoint was shared in psychology (Dworkin, 1988; Erikson, 1998) and was expanded to including the concept of individual autonomy, reflecting an esteemed trait of human beings as the source of human dignity (Racine et al., 2021). Therefore, we propose dignity as one component of autonomy in our study.

Kant defines autonomy as the property by which it is a law to itself, independent of any property of the objects of volition (Kant, 1870). This means that a person with an autonomous character can self-rule independently of any external determination. A similar way of thinking is shared by some developmental psychologists: for Piaget (1983), an individual is "morally" autonomous when decisions and actions are independent of any external influences, especially of adult authority. Others define autonomy directly as resistance against authoritarian and normative influences (Kohlberg, 1981; May, 1994; Erikson, 1998). From this view, acting autonomously requires the ability to decide and act independently of others, whether those others are one's parents in childhood, other authority figures, peers, or merely well-established social norms.

To conclude, we suggest *independence from others* as the second essential component of autonomy (Dworkin, 1988).

Self-awareness is often discussed in relation to autonomy (Bekker, 1993; Bekker and van Assen, 2008; Pauen and Welzer, 2015; Moleiro et al., 2017). Being self-aware means awareness of one's own opinions, wishes, and needs. Similarly, the Aristotelian concept of autonomy relies on "self-regulation" and is shared by modern psychologists: Ryan and Deci (2006, p. 101860) define autonomy as "a sense of initiative and ownership in one's actions. It is supported by experiences of being externally controlled, whether by rewards or punishments." They also advocate a proactive and reflective conception of autonomy, one that is based on self-regulatory processes involved in initiating, controlling, and evaluating one's decisions and actions (Swann and Jetten, 2017; Ryan and Deci, 2020). Racine et al. (2021) also argue that the ability to regulate attention, emotions, and behavior is an invaluable component of autonomy since, without it, individuals merely react in the moment instead of taking long-term goals and values into consideration. Thus, autonomous individuals control their development and determine the course of their lives while monitoring the costs and benefits of their choices (Oshana, 2006). In summary, we consider *self-awareness,* in the sense of being aware of one's own opinions, wishes, and needs, as the third component of autonomy.

Kant's foremost statement on autonomy is the term moral autonomy (Kant, 1870). *Morality* displays what is the "right" or "wrong" way in human interaction, for example, being just to others or being unjust (Ellemers et al., 2019). Some scholars value autonomy as the right of individuals to act and decide freely as long as they do not violate the rights of other humans (Dworkin, 1988; Racine et al., 2021). Some also believe that only by acting autonomously do people form their moral standards (Chirkov, 2011). A morally autonomous person reflects on moral principles and critically examines them before approving them (Oshana, 2006). However, although the link between autonomy and morality appears to be evident in theory, there is still a need for specification in empirical research. Taken together, we advocate *morality* as the fourth component of autonomy.

Other conceptions contrast autonomy with norm-oriented thinking and acting. Warren and Campbell (2014) define extreme autonomy as completely ignoring typical conventions and not acting on them. Likewise, Kohlberg et al. (1983) third and highest level of moral development is called the post-conventional level, meaning being unbound by norms and conventions. On this level, the value of ideas and behaviors is no longer predefined by objective principles, social conventions, or subjective feelings and perspectives (Shweder et al., 1990). Such *unconventionality* has empirically been found to predict winding, autonomous career paths (Schwaba et al., 2019). Last, during an epoch of widespread rebellion of students against society's establishment in many Western countries, a study at UCBerkeley run in the 1960s reported a non-conventional, so-called subcultural group to express a significantly higher need for autonomy than a random college student sample (Whittaker and Watts, 1967). Therefore, we suggest *unconventionality* as the fifth component of autonomy.

In summary, social science scholars, mostly philosophers and psychologists, proposed autonomy be defined by dignity, independence from others, morality, self-awareness, and unconventionality. We use these five components (in the preregistration referred to as "criteria") for our investigation into whether, and to what degree, this scientific perspective corresponds with the understanding of laypersons. In Study 1, we used a qualitative approach, gathering examples of autonomous behaviors from laypersons, which we then categorized systematically with the help of naive research assistants. In Study 2, we asked new participants to rate the categorized behaviors concerning how autonomous they found them. Finally, in Study 3, we tested with yet another sample of participants whether the five behavioral categories rated highest in autonomy produced higher ratings of the components than the five behavioral categories rated lowest in autonomy. We also expected dignity, independence from others, morality, self-awareness, and unconventionality to be moderately inter-correlated (around 0.40).

All three studies were conducted as online surveys, were set up with the SoSci survey tool (Leiner, 2019), and were preregistered before the collection of data (Zey and Windmann, 2020). Written informed consent was obtained in all studies, and the research project was approved by the ethics committee of Goethe University Frankfurt (Reference number: 2019-49, Oct 20th, 2019). Data analyses for all three studies were carried out in R4.1.2 (R Core Team, 2021) using RStudio (RStudio Team, 2021) and the packages *car* (Fox and Weisberg, 2019), *corrgram* (Wright, 2021), *descr* (Enzmann et al., 2021), *dplyr* (Wickham et al., 2021), *ez* (Lawrence, 2016), *ggplot2* (Wickham, 2016), *psych* (Revelle, 2021), *reshape2* (Wickham, 2007), *rstatix* (Kassambara, 2021), *see* (Lüdecke et al., 2021), and *tidyr* (Wickham, 2021). All data and scripts can accessed online *via* the Open Science Framework (Zey and Windmann, 2020).

STUDY 1: LAYPERSONS' EXAMPLES OF AUTONOMY

Method
Sample
Following our preregistration, we recruited $N = 222$ fully completed online questionnaires *via* social media and our department's homepage. We assessed age ($M = 34.58$, $SD = 14.61$, ranging from 19 to 82 years), education (49.10% university or college degree, 36.94% A-levels, 7.21% trained profession, 4.96% secondary school certificate, 1% school-leaving certificate, and 1% no finished degree), and gender identification (142 females, 70 males, 5 diverse, 5 not specified) (Bekker and van Assen, 2006). Participants completed the questionnaire in $M = 7.18$ min and received no compensation for participating.

Materials and Procedure
We asked participants to list at least three and up to 10 examples of autonomous behaviors, asking "What do you consider to be examples of autonomous (self-determined) behaviors?" We obtained a total of 859 examples. Before categorizing, we eliminated 21 examples (1%) for having no meaning (e.g., "xxx"),

23 examples (1%) for paraphrasing core parts of the instruction (e.g., "self-determined"), and 7 examples (<1%) for containing the exact paraphrasing of one of the components used in Study 3 (e.g., "independence"). With the help of two assistants who were blind to the hypothesis of the study and worked independently of one another, we sorted the remaining 807 examples into categories. They clustered examples with the same or very similar meaning (e.g., "healthy eating" and "good nutrition") into one category. In the end, a third mediating assistant helped to discuss and resolve diverging decisions.

We then defined the minimum size of eight examples per category (∼1% of the total), a change from the preregistration, where we had specified a minimum size of two examples per category. Reviewing the materials, we found that a minimum of two examples would have resulted in quite a high number of unequally sized categories. Thus, we dropped 54 examples that were either unique or formed categories with fewer than eight examples (e.g., "planting a tree"). We found 28 singular examples that did not match any other examples (e.g., "giving a talk") and therefore could not be categorized.

In summary, based on the assistants' categorizations, we sorted 725 examples into 34 categories. See the Open Science Framework project (Zey and Windmann, 2020) for the complete list of unedited responses and all steps of categorization and editing.

Additionally, in all three studies, we assessed 16 items of the horizontal/vertical and individualistic/collectivist orientation short scales (Priestley et al., 2020), as well as marital status, religion, and female rights for other research purposes; these data are not relevant for the present research.

Results and Discussion
An average of 3.9 responses per participant were taken and categorized into the 34 categories presented in **Table 1**. In Study 2, we proceeded to ask laypersons as to how autonomous they rate each of these items.

STUDY 2: RANKING AUTONOMOUS ACTS

Method
Sample
We recruited a new sample *via* social media and collected complete data sets from $N = 114$ participants. As preregistered, we excluded participants for not answering the control question correctly ($n = 6$), leading to $N = 108$ participants. Participants reported ages ($M = 26.33$, $SD = 8.54$) ranging from 19 to 56, education (37.04% university or college degree, 51.85% A-levels, 7.41% trained profession, 3.70% secondary school certificate, and no one with no finished degree), and gender identification (83 females, 24 males, 0 diverse, 1 not specified).

Materials and Procedure
Participants were asked to rate "how autonomous" each of the 34 categories of behavioral examples generated in Study 1 "is to them" on a five-point Likert scale (1 = "not at all autonomous" to 5 = "completely autonomous"). One attention check item was presented at a randomized position in the list of valid categorical

TABLE 1 | Frequencies of the 34 edited categories of examples of autonomy behaviors obtained in Study 1 ($N = 222$), and mean autonomy ratings of Study 2 ($N = 108$) in ascending order.

Item description (English translation)	Study 1	Study 2	Study 2, female sub-sample	Study 2, male sub-sample
	Frequencies of mentions per category	M (SD)	M (SD) n = 83	M (SD) n = 24
Acting contrary to societal expectations and laws	23	3.34 (1.18)	3.30 (1.16)	3.46 (1.28)
Designing working conditions	23	3.46 (1.00)	3.53 (0.98)	3.17 (1.01)
Shaping one's living situation	27	3.55 (1.03)	3.64 (1.04)	3.25 (0.94)
Travel	21	3.56 (1.18)	3.59 (1.12)	3.38 (1.38)
Acting uninfluenced by external factors	31	3.60 (1.16)	3.61 (1.09)	3.50 (1.38)
Shopping and consuming the way one likes it	10	3.69 (1.05)	3.66 (1.05)	3.79 (1.10)
Shaping one's educational path	34	3.78 (1.08)	3.81 (1.12)	3.67 (0.96)
Taking care of oneself financially	19	3.79 (1.06)	3.81 (1.01)	3.71 (1.27)
Positioning oneself politically	36	3.79 (1.12)	3.78 (1.12)	3.92 (1.02)
Determining time schedule and daily schedule	29	3.79 (0.95)	3.82 (0.95)	3.71 (0.95)
Realizing life plan	17	3.83 (0.90)	3.84 (0.92)	3.83 (0.87)
Feeling what one needs	10	3.85 (1.01)	3.92 (1.00)	3.67 (1.05)
Eating, drinking, sleeping, etc., when and how one wants to	33	3.86 (1.11)	3.86 (1.09)	3.83 (1.17)
Allowing irreversible changes to be made to one's body	11	3.86 (1.19)	3.86 (1.23)	3.92 (1.06)
Being mobile and getting around	14	3.87 (0.99)	3.93 (0.92)	3.71 (1.20)
Deciding about expenses and investments	10	3.90 (1.03)	3.87 (1.02)	4.08 (1.02)
Saying no and setting limits	15	3.92 (1.09)	3.93 (1.06)	4.00 (1.10)
Being creative	9	3.94 (1.16)	3.99 (1.11)	3.79 (1.35)
Deciding about love and sexuality	13	3.96 (1.13)	3.98 (1.12)	3.96 (1.20)
Contraception and family planning	11	3.98 (1.08)	3.99 (1.02)	4.00 (1.29)
Being caring about one's own needs	18	3.98 (0.95)	4.00 (1.00)	3.92 (0.78)
Spending free time alone	10	4.01 (1.11)	4.05 (1.11)	3.88 (1.12)
Freely practicing religion and spirituality	13	4.05 (1.05)	4.11 (0.98)	3.79 (1.28)
Developing personality freely	12	4.05 (0.96)	4.10 (0.96)	3.88 (0.99)
Determining clothing style	18	4.06 (0.97)	4.06 (0.92)	4.04 (1.16)
Asserting one's own goals	12	4.06 (0.89)	4.07 (0.89)	4.00 (0.88)
Choosing a profession	40	4.07 (0.98)	4.07 (0.95)	4.04 (1.12)
Expressing opinions	31	4.09 (0.95)	4.13 (0.95)	3.92 (0.97)
Organizing free time	43	4.11 (0.92)	4.12 (0.85)	4.12 (1.15)
Determining with whom one surrounds oneself with	25	4.18 (0.86)	4.19 (0.88)	4.12 (0.85)
Deciding for oneself	46	4.29 (0.88)	4.31 (0.59)	4.25 (0.90)
Thinking critically and questioning	18	4.31 (0.93)	4.29 (0.90)	4.46 (1.02)
Staying true to oneself	16	4.31 (0.88)	4.36 (0.89)	4.17 (0.82)
Choosing partners	27	4.33 (0.90)	4.31 (0.91)	4.38 (0.88)

items. Participants completed the questionnaire in $M = 5.99$ min and were not compensated for participating.

Results and Discussion

On average, the categories of the examples of Study 1, listed in **Table 1**, were rated quite high in autonomy ($M = 3.92, SD = 0.59$, CI [3.81, 4.03] on the scale from 1 to 5). The highest-rated five items yielded a mean rating of $M = 4.28, SD = 0.64, CI$ [4.16, 4.40] and the lowest-rated five items a mean rating of $M = 3.50$, $SD = 0.73, CI$ [3.36, 3.64]. All categories contained between 9 and 46 examples, and each category included an average of 21

examples. The five high-autonomy items (categories) contained on average 26.4 examples per category, whereas the five low-autonomy items contained on average 25 examples per category, so they are quite comparable in size. The frequencies (number of examples per category) and the autonomy ratings also did not correlate, $r_{(34)} = 0.05, p = 0.77$, with the autonomy items.

Table 1 also shows mean ratings of female and male participants separately, demonstrating that the ranking of the five highest- and lowest-rated examples for the two groups is nearly identical. Only the categories ranked fifth ("determining with whom one surrounds oneself with") and sixth in position

("organizing free time") are interchanged in their order between the entire sample and the male-only sub-sample.

In Study 3, we compared how well the high- and low-autonomy items reflected the components' dignity, self-awareness, independence from others, and unconventionality, from the standpoint of laypersons.

STUDY 3: WHAT CHARACTERIZES ACTS PERCEIVED AS AUTONOMOUS?

Method

Sample

We recruited a new sample of participants with the help of students who spread the survey *via* social media and personal contacts. Unexpectedly, a much higher number of data sets ($N = 478$) than preregistered ($N = 175$) were collected within only a few days. After excluding $n = 53$ persons taking longer than 1.75 times the median time ($Mdn = 7.21$ min), as preregistered, we still had $N = 444$ data sets. To accord with the sample size in our preregistration, we considered using only the first 175 participants, but these showed a disproportionately large number of women (147 females, and 28 males, 0 diverse). Therefore, we included only the first $n = 88$ women (50%) in the data analysis, alongside the one diverse participant, and recruited more male participants, up to $n = 86$, so that the final distribution was gender-balanced. However, using the entire sample ($N = 444$), we repeated the analysis and found that the result pattern did not differ in any relevant way (see **Supplemental Materials**).

Thus, we here report the data of $N = 175$ participants (age: $M = 38.90$, $SD = 11.13$, ranging from 20 to 75 years; education: 62.29% university or college degree, 12.57% trained profession, 19.43% A-levels, 4.57% secondary school certificate, 0.57% school-leaving certificate, and 0.57% no finished degree; gender identification: 88 females, 86 males, 1 diverse). Participation ($M = 7.72$ min) was not compensated for.

Materials and Procedure

Participants rated the five highest-and five lowest-rated autonomy items (as found in Study 2) regarding "how strongly these stand for" dignity, independence from others, morality, self-awareness, and unconventionality on a five-point Likert scale (e.g., 1 = "not at all self-aware" to 5 = "completely self-aware").

Statistical Analysis

In line with the preregistration, we first conducted a two-factorial ANOVA (Analysis of Variance) with repeated measures (5 components × 2 autonomy levels). Next, we compared high-autonomy vs. low-autonomy examples on each of the five components separately using the Wilcoxon signed-rank test. We adjusted alpha levels with Bonferroni corrections to $\alpha_{Bonferroni} = 0.01$ and we used Huynh-Feldt corrected p-values to account for violations of sphericity (Girden, 1992; Field et al., 2012). As a measure of effect size, we report the generalized eta square, $\eta_G{}^2$, for comparability across between-subjects and within-subjects designs (Bakeman, 2005). We analyzed the

pairwise linear relationships between the components using Spearman's correlation coefficients.

Results and Discussion

Conducting the ANOVA as preregistered, we found a significant main effect of autonomy level, $F_{(1,174)} = 441.94$, $p < 0.001$, $\eta_G{}^2 = 0.12$, and a significant main effect for the components, $F_{(4,696)} = 204.44$, Huynh–Feldt corrected $p < 0.001$, $\eta_G{}^2 = 0.39$. The interaction of autonomy level and the components was also significant, $F_{(4,696)} = 110.61$, Huynh–Feldt corrected $p < 0.001$, $\eta_G{}^2 = 0.07$. Pair-wise Wilcoxon comparisons revealed significantly higher ratings between high-autonomy and low-autonomy for the components' dignity ($Mdn_{high} = 4.6$, $Mdn_{low} = 3.8$, $W = 25,336$, $p < 0.01$, $ES = 0.57$, large), independence from others ($Mdn_{high} = 4.2$, $Mdn_{low} = 3.4$, $W = 25,020$, p < 0.01, $ES = 0.55$, large), morality ($Mdn_{high} = 4.2$, $Mdn_{low} = 3.4$, $W = 23,954$, $p < 0.01$, $ES = 0.49$, moderate), and self-awareness ($Mdn_{high} = 4.8$, $Mdn_{low} = 4.0$, $W = 23,614$, $p < 0.01$, $ES = 0.47$, moderate), but not for unconventionality ($Mdn_{high} = 2.6$, $Mdn_{low} = 2.8$, $W = 12,668$, $p = 0.005$, $ES = 0.15$, small), where the high-autonomy items actually obtained significantly lower ratings compared to the low-autonomy items (see **Figure 1**). As expected, we found medium-sized correlations between dignity, self-awareness, independence from others, and morality, but not for unconventionality (**Table 2**).

GENERAL DISCUSSION

Using a bottom-up empirical approach, we examined laypersons' perceptions of autonomy with components derived from the philosophical and psychological literature. Across three studies, we identified how laypersons exemplify autonomous behaviors. As expected, we found that behaviors characterized by high autonomy are rated significantly higher in their perceived dignity, independence from others, morality, and self-awareness than those low in autonomy. These results show the assumed connection between the scientific perspective on autonomy and the everyday perspective of laypersons, and thereby provide a foundation for further research on the concept of autonomy.

We also found medium-sized correlations between the components' dignity, independence from others, morality, and self-awareness. For the proposed component unconventionality, we did *not* find any significant correlations with the other components, and the effect in the ratings was *reversed*, i.e., the high-autonomy items were rated significantly lower in unconventionality than the low-autonomy items.

Particularly instructive is a qualitative consideration of the sorted items. Looking at the five high-autonomy items, we find two themes. First, the items "choosing a partner," "staying true to oneself," and "determining with whom one surrounds oneself with" focus on interpersonal relationships and/or express a clear distinction of the self from others by focusing on oneself. The item "choosing a partner" was rated the highest, suggesting that autonomy especially plays a role in defining one's relationship with other people, and the choice of close ones. The other
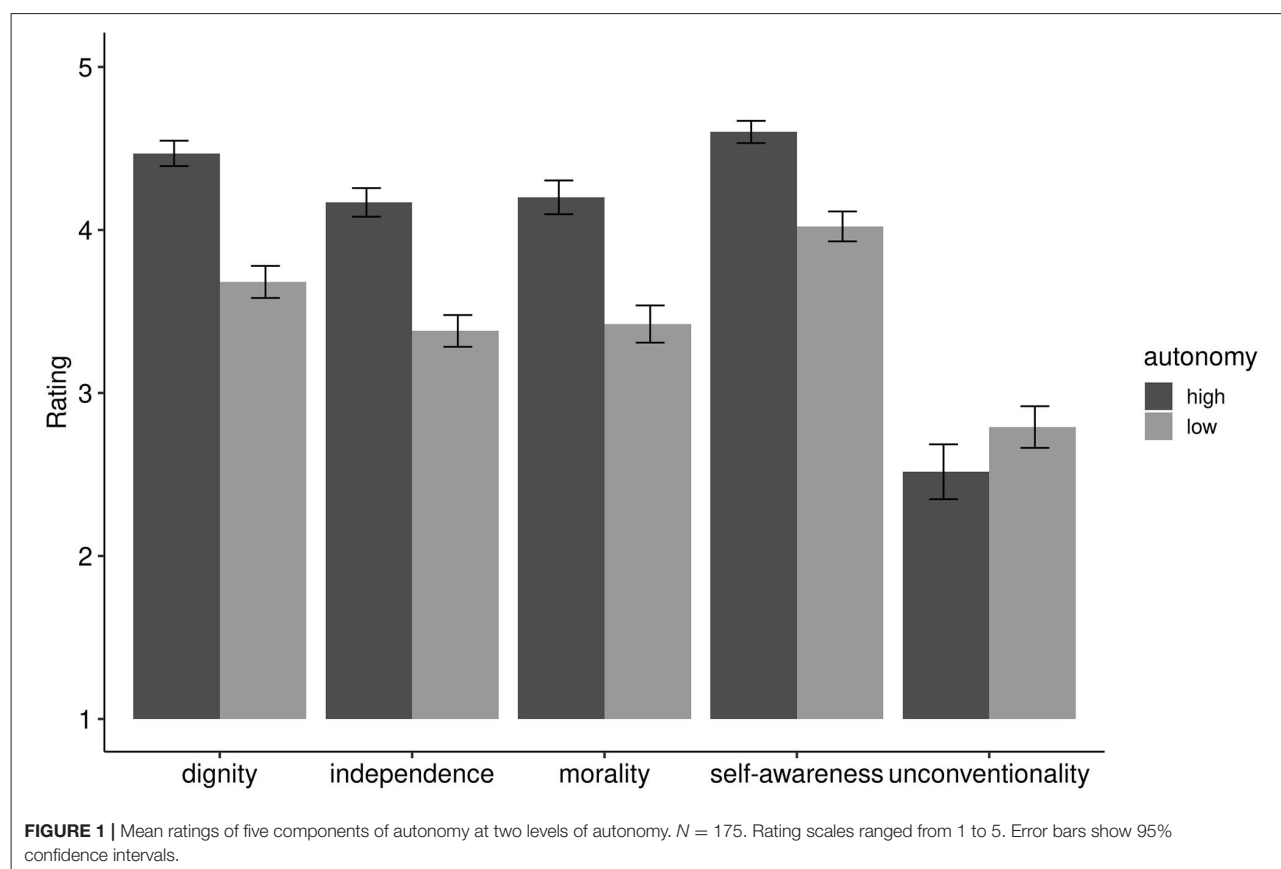
FIGURE 1 | Mean ratings of five components of autonomy at two levels of autonomy. $N = 175$. Rating scales ranged from 1 to 5. Error bars show 95% confidence intervals.

TABLE 2 | Descriptive statistics and Spearman's rank inter-correlations r_S (p-value) for the five autonomy components.

	M	*SD*	1	2	3	4
1. Dignity	4.08	0.53	–			
2. Independence from others	3.78	0.55	0.50 (< 0.01)	–		
3. Morality	3.81	0.66	0.61 (< 0.01)	0.33 (< 0.01)	–	
4. Self-awareness	4.31	0.47	0.60 (< 0.01)	0.39 (< 0.01)	0.46 (< 0.01)	–
5. Unconventionality	2.65	0.94	−0.05 (0.54)	−0.10 (0.21)	−0.08 (0.32)	−0.11 (0.16)

N = 175, Holm-Bonferroni correction results in an significance level of α = 0.01 for the p-values.

two high-autonomy items focus on reflected decision-making: "deciding for oneself" and "thinking critically and questioning." In this manner, high autonomy seems to play a role in both, reflected thinking and deciding as well as in freely determining social relationships.

Conversely, reviewing the five lowest-rated items, we found a wide variety of themes: "acting contrary to societal expectations and laws," "designing working conditions," "shaping one's living situation," "travel," and "acting uninfluenced by external factors." On the one hand, "acting uninfluenced by external factors" and "acting contrary to societal expectations and laws" come very close to the definition of autonomy as resistance against external influences (Kohlberg et al., 1983; May, 1994; Erikson, 1998). On the other hand, the social relationship theme in the

high-autonomy items suggests that laypersons do not merely see autonomy as a reaction to external influences, but more as a chance to proactively implement their preferences after well-reflected consideration. This entanglement of autonomy with interpersonal factors and reflective thinking has been stressed before (Ryan and Deci, 2006; Chirkov, 2011). It relates to the concept of reflective autonomy proposed by Koestner and Losier (1996), who divide autonomy into *reactive* and *reflective* autonomy. While reactive autonomy is seen as an "interpersonal conception of autonomy that highlights people's desire to resist influence or coercion," reflective autonomy is a "conception of autonomy that emphasizes people's desire to feel like the origin of their actions and to have input into determining their behavior" (Koestner and Losier, 1996, p. 488). Thus, our findings suggest

that laypersons have a view of autonomy that includes both reactive and reflective aspects, but that reflective items ("deciding for oneself," "thinking critically and questioning," "choosing a partner," "staying true to oneself," and "determining with whom one surrounds oneself with") appear to weigh on average more heavily than the reactive items ("acting uninfluenced by external factors," and "acting contrary to societal expectations and laws"). This implication could be further examined in future studies, taking the distinction between reactive and reflective autonomy into consideration.

High-and low-autonomy items were differentiated by the components' dignity, independence from others, morality, and self-awareness. By contrast, the component unconventionality did *not* distinguish between high- and low-autonomy behaviors in the proposed direction but instead showed an unexpected significant *reverse* differentiation. At the same time, the overall average of the ratings was lower for unconventionality than for the other four components, suggesting that this component is generally perceived to be less indicative of autonomy. Contrary not only to the literature but also to our preregistration, unconventionality falls out of line considering the correlations between the components.

However, some examples given in Study 1 did mention unconventionality explicitly, as one person listed "unconventional thinking," and another participant listed "acting despite conventions." When we consider the categories, two of the low-autonomy items explicitly name acting "uninfluenced by external influences" and "contrary to societal expectations and laws," both of which are almost identical to common definitions of unconventionality (Shweder et al., 1990). Notably, however, unconventionality is the only component with an inverted framing (being *not* within conventions), whereas the other components are all positively framed. This may have triggered or at least contributed to the reversal of the difference. Future research should investigate this component using positive phrasing (such as "originality" or "open-mindedness") congruent with the positive phrasing of the other components.

Another possible explanation may lay in the theoretical foundation of unconventionality as a component of autonomy. This component has been derived from the theory of moral development (Kohlberg, 1981; Kohlberg et al., 1983), where the post-conventional level is the highest level of moral development. According to Kohlberg, however, only a very small number of individuals reach this level, so it is plausible that relatively many participants do not recognize post-conventional behavior as particularly autonomous.

Finally, autonomy is sometimes seen as an equivalent or even synonym of individualism, a view that has been criticized by modern scholars who propose autonomy to be universal (Chirkov, 2008). Our participants' top autonomy items indicate that they perceive autonomy as being "in control" in social relationships, i.e., being able to oppose obligations arising from social relationships (Walter and Ross, 2014). In their (Western) cultural view, the individualistic understanding of autonomy is conventional, and any collectivist, relational, or embedding perspectives are unconventional (Inglehart and Oyserman, 2004). Whether this explains our observation of a (reverse) effect of

autonomy on the unconventionality ratings will have to be tested in cross-cultural studies. In light of this, the question of whether, and in what cultural contexts, autonomy leads to greater wellbeing may be addressed (Chirkov, 2008; Walter and Ross, 2014).

Several benefits and insights arise from our findings. Practically, knowing about laypersons' understanding of autonomy could aid psychological research in operationalizing autonomy in scales, surveys, and experiments. Thus, when creating scales to measure autonomy, future research can benefit from taking not only the confirmed components but also the specific examples we collected into account.

At the theoretical level, establishing *self-awareness* as a component of autonomy is in line with the feminist approach to *autonomy-connectedness* (Bekker, 1993; Bekker and van Assen, 2008; Bachrach et al., 2013), which defines self-awareness, next to sensitivity to others and capacity for managing new situations, as one of three sub-scales. The conception of autonomy-connectedness arises from the idea of gender differentiation. It integrates the presumed feminine aspects of identity, including the need and capacity for intimacy and functioning in intimate relationships, and the (more masculine) need and capacity for separation and independence (Bekker, 1993).

Additionally, confirming *morality* as a component is in line with the related constructs of moral agency (Black, 2016) and moral integrity (Arvanitis and Kalliris, 2020). Viewing *dignity* as another component of autonomy can be particularly relevant in the context of health care and nursing. Specifically, it could be helpful for research on and work in geriatric psychology (Randers and Mattiasson, 2004), where fostering the autonomy of patients could lead to more wellbeing and maintaining a sense of dignity. Lastly, the component *independence from others* was also named several times as an example by the laypersons in Study 1. This is in line with the formula autonomy = authenticity + independence (Dworkin, 1988). It is also found in the personality theory by Angyal (1941), proposing that life follows a process between two forces: autonomy as "tendency of the personality toward a greater self-determination" and homonomy as a "tendency toward conformity with the superindividual wholes of society, culture" (Angyal, 1941, p. 365). This demonstrates that autonomy largely depends on the interplay between an individual and their environment, and that an understanding of autonomy as mere independence from others fails to understand the human nature of social beings.

Modern and feminist views on autonomy in particular, e.g., the autonomy-connectedness conception, stress the role of social identity, social interaction, and interdependence instead of independence (Bekker and van Assen, 2008; Pianca and Santucci, 2022). Other feminist authors highlight the need for independence in the sense of objectivity, meaning informed, flexible, and critical attachment to others while considering one's biography and interpretations (Cooke, 1999). Sayer (2011) understands autonomy as self-rule and capacity within social relationships and responsibilities more than as complete independence from others. The author also states that responsibilities are the key to exercising self-command whilst being accountable for others. This relates to empirical

studies showing how attachment or interdependence can lead to greater autonomy. According to Collins and Feeney (2004, p. 173), securely attached individuals "are able to maintain close relationships without losing personal autonomy."

Thus, modern views link autonomy to interdependence rather than independence. Within the framework of SDT, autonomy is defined as self-governance, or rule by the self, whereas heteronomy is defined as the opposite, meaning "regulation from outside the phenomenal self, by forces experienced as alien or pressuring, be they inner impulses or demands, or external contingencies of reward and punishment" (Ryan and Deci, 2006, p. 1562). In noting that individuals may have chosen to be dependent or, conversely, may have been forced into independence due to circumstances, SDT also explicitly distinguishes autonomy from independence. Ryan et al. (2005) state that, while autonomy is commonly equated with independence, SDT differentiates the two by defining dependence strictly in the sense of reliance and finding that people are more likely to depend on those who support their autonomy. In line with the older understanding of independence by classical developmental psychology, we still used independence in this study, and the laypersons found that the high autonomy examples could be differentiated from the low autonomy examples by their independence from others. Nonetheless, future research should take the enhancement from independence to interdependence into account and examine laypersons' ratings of autonomous examples while distinguishing between independence and interdependence.

Strengthening the definition and understanding of autonomy can not only benefit the empirical discourse but may also have an empowering impact on human and societal life through applications. Without a doubt, autonomy is highly important on an individual level, e.g., according to SDT, autonomy is one of the three basic psychological needs for wellbeing (Yu et al., 2018; Ryan and Deci, 2020). Empirically, it has been shown that experiencing higher autonomy without necessarily eliminating extrinsic motivation fosters wellbeing (Kukita et al., 2022). Dignity, independence from others, morality, and self-awareness, may be used, perhaps in a context-specific manner, to specify and enrich practice-oriented discussions and interventions. One example is artificial intelligence (Calvo et al., 2020), but therapeutic or coaching settings are just as plausible, especially considering personality disorders like avoidant personalities. At the workplace, autonomy plays a crucial role in employee engagement and wellbeing (Gagné and Bhave, 2011), where workshops could help to boost self-awareness and autonomous decision-making. In general, our results could improve communication of scientific perspectives in applied settings and also with the public.

The methodological appeal of the approach used in this research is the change from the scientific perspective to the layperson's perspective, which is indicative of everyday relevance and parlance (Kraft-Todd and Rand, 2019). However, it comes with some limitations: First, in the present implementation, following Kraft-Todd and Rand (2019), we used only 10 examples out of the 34 categories. These 10 varied in their level of autonomy, but even the low-autonomy items obtained mean

ratings above 2.5, which is the midpoint of the used rating scale. In future investigations, a wider range of autonomy items could be used to compare items that are absolutely high in autonomy to those that are absolutely low.

Additionally, the present research is, even though preregistered, an exploratory investigation, and just as for the research on heroism by Kraft-Todd and Rand (2019), further replications and confirmatory studies are needed. Another shared aspect with the research of heroism by Kraft-Todd and Rand (2019) is that many of the examples, rendered by the lay persons in Study 1, described not so many specific acts but goals, values, and process features underlying mere classes of behaviors (like "deciding what is good for me" or "free voting rights"), even though our instructions explicitly referred to "examples of behaviors." On the one hand, the relatively high educational level of our participants may partly explain why abstract terms were provided so readily. On the other hand, the over-inclusive and generalizing interpretations that our participants applied to the task instructions may demonstrate how hard it is to break down autonomy (and self-determination) into observable behaviors. For experimenters, this implies that autonomy is difficult to operationalize. Owing to its multi-component and principled nature, the feeling of autonomy appears to be based more on subjective reflections on the antecedents and conditions of choices and preferences than on specific observable and executable behaviors.

Methodologically, since we recruited mainly *via* social media and personal contacts, the samples in all three studies show some selection biases: first, the overall education of our three samples is rather high in comparison to the average population, while their age is lower than representative. Second, more females than males participated in our uncompensated questionnaires. In Study 1, the imbalance amounts to about 2:1 (64% female, 32% male, 2% diverse, 2% not specified). Naturally, our approach builds upon the examples generated in Study 1, and thus the characteristics of the sample of participants generating these. However, in Study 2, where the gender ratio was quite strongly divergent from representative (77% female, 22% male, 0% diverse, 1% not specified), we looked directly into the effects of gender (**Table 1**), and could not find any practically relevant differences. Moreover, in Study 3, where we had unintentionally exceeded our preregistered sample size, 357 women and, with a ratio of 5:1, only 86 men participated originally. When we paired the male participants with the first 88 female participants to generate a sample with a balanced gender ratio, the resulting pattern was the same in the entire sample of all 444 participants. Taken together, these observations lead us to conclude that gender differences are not a relevant factor in the present results. We do, however, acknowledge an educational bias that is probably related to the distribution of ages. The sample in Study 1 was rather highly educated (49% had college/university degrees) and the age was, even though ranging from 18 to 82, younger than the German average population, with an average of 44 years (Statistisches Bundesamt, 2020). These characteristics might have influenced the choice of youth-specific topics like "choosing a profession" and "deciding for oneself." Topics that are more relevant to older adults might be underrepresented. To

embrace the perspective of patients and older adults (Sherwin and Winsby, 2011), it would be beneficial to include older adult participants in future studies. Finally, our German sample reflects only a small fraction of possible cultural backgrounds and further contributes to the bias of Western, educated, industrialized, rich, and democratic (WEIRD) societies in the social sciences (Henrich et al., 2010). Other cultures, especially those high on collectivism, would certainly show a different understanding and evaluation of autonomy, perhaps one that involves unconventionality to a higher degree. Especially since autonomy is a concept highly valued in individualistic societies, a comparison between more individualistic and more collectivist socialization could allow a more holistic and less WEIRD view of autonomy.

To conclude, the present research helps to characterize the components defining autonomy. We demonstrate an empirical approach to relating scholarly conceptions of autonomy to everyday manifestations. In this sense, our findings delineate the real-life behavioral implications of autonomy.

DATA AVAILABILITY STATEMENT

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found at: https://osf.io/ugk3w/.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2022.871797/full#supplementary-material

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Article 2: Effects of Message Framing, Sender Authority, and Recipients' Self-Reported Trait Autonomy on Endorsement of Health and Safety Measures during the Early COVID-19 Pandemic

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Article

Effects of Message Framing, Sender Authority, and Recipients' Self-Reported Trait Autonomy on Endorsement of Health and Safety Measures during the Early COVID-19 Pandemic

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Abstract: In the COVID-19 pandemic, human solidarity plays a crucial role in meeting this maybe greatest modern societal challenge. Public health communication targets enhancing collective compliance with protective health and safety regulations. Here, we asked whether authoritarian/controlling message framing as compared to a neutral message framing may be more effective than moralizing/prosocial message framing and whether recipients' self-rated trait autonomy might lessen these effects. In a German sample ($n = 708$), we measured approval of seven regulations (e.g., reducing contact, wearing a mask) before and after presenting one of three Twitter messages (authoritarian, moralizing, neutral/control) presented by either a high-authority sender (state secretary) or a low-authority sender (social worker). We found that overall, the messages successfully increased participants' endorsement of the regulations, but only weakly so because of ceiling effects. Highly autonomous participants showed more consistent responses across the two measurements, i.e., lower response shifting, in line with the concept of reactive autonomy. Specifically, when the sender was a social worker, response shifting correlated negatively with trait autonomy. We suggest that a trusted sender encourages more variable responses to imposed societal regulations in individuals low in autonomy, and we discuss several aspects that may improve health communication.

Keywords: autonomy; morality; authority; prosocial behavior; framing; messaging; COVID-19 regulations; social distancing

1. Introduction

Social media can have a profound impact on how we understand our societies, what we anticipate and experience, what we value, how we feel, and how we behave. In order to convince people to engage in a certain behavior, what matters is not only the content of the message, but also how and by whom it is delivered.

1.1. Literature Review

Regarding the how, *message framing* is one way to vary the persuasiveness of delivered information [1]. First, Tversky and Kahnemann looked into the phenomenon of why people systematically violate consistency and coherence in rational decision-making, and they demonstrated that seemingly inconsequential changes in the formulation (framing) of choice problems caused large and systematic shifts of choice preferences even though mathematically, the expectancy value of all options remained the same. In the original research, most often loss and gain framing have been compared. More generally, Tversky and Kahnemann describe three different types of framing: the framing of acts, contingencies, and outcomes, and the characteristic nonlinearity of values and decision weights [2].

Since then, many empirical studies have confirmed that message framing in communication has a significant effect on judgment and decision making [3], extending to the domain of health protection behaviors [4]. For example, short reminders sent via

smartphone have been shown to increase adherence to drug treatment plans [5]. With the right framing, smartphone messages can also function as a reminder to act morally "good" and for the well-being of others. Prosocial framings that highlight the role of others, such as close persons, one's children or loved ones, and even strangers, have been shown to increase people's intentions to get a vaccination, more so than a self-oriented frame did [6].

By contrast, a binding moral frame was found to effectively shift decisions of conservative participants into a pro-environmental direction when protecting the environment was framed as a matter of obeying authority [7]. Especially in times of threat to collective well-being as through a global pandemic, the prevailing feeling of uncertainty might make groups or societies susceptible to authoritarianism [8–10]. Under those conditions, strong injunctive norms might provide a feeling of safety with regards to how one should or should not behave [11]; thus, demanding or controlling message framing might be most effective.

Sender characteristics such as their authority status may be other key factors when it comes to the question of effective communication. In his famous experiment, Milgram investigated the decisions of participants under the influence of an authority figure, the experimenter, and found a very high proportion of participants to give electric shocks to another person merely because the experimenter told them to do so [11]. More recent research confirms that an authority or legal system, when perceived as legitimate, does not require any type of explanation or justification for people to obey [12,13]. It appears as if people tend to succumb to the influence of leadership once they accept the existing power relations.

However, not all people are the same, in the sense that message framing and sender characteristics are likely to interact with the personality traits of the recipients of the message. The arguably most important personality trait in this context may be *autonomy* (Greek αυτόνομος: 'auto' means self and 'nomos' means law), literally translated best as the ability to follow one's own rules. According to Piaget, an individual is autonomous if decisions and actions are independent of external influences, especially of adult authority [14]. Other developmental scientists also associate autonomy with not conforming to others, or not reacting to social judgment, again especially that of adults [15,16]. Such conceptualizations are captured by the term *reactive autonomy* [17]. Modern frameworks see autonomy more proactively linked to an agent's ability to determine and shape their own environment [18]. The present study compromises in understanding autonomy as consistently self-determined thinking and acting, which implies (but is not limited to) resistance against social influences. We set out to investigate: how do high- as compared to low-autonomy individuals respond to demanding regulatory messages in times of the COVID-19 crisis?

1.2. Global SARS-CoV-2 Pandemic

The global SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) pandemic has been and still is threatening the health and lives of millions of people. To reduce the transmission of the virus and the spread of the disease, several health measures (e.g., physical distancing, quarantine, and handwashing) were ordered by a number of governments and authorities since the outbreak. Compliance of individuals with these measures is essential to slow down the spread of the virus [19]. Thus, the situation requires each and every individual to accept restrictions on their personal freedom and autonomy, for the greater good of all.

Many countries around the world implemented a number of nonpharmaceutical interventions colloquially known as lock-downs (encompassing stay-at-home orders, curfews, quarantines, and other regulations) to reduce the spread of SARS-CoV-2 which causes COVID-19 [20]. As in most Western, educated, industrialized, rich, and democratic (WEIRD) countries, a stay-at-home order was also instituted in Germany in early April 2020, the time and place where the present study was conducted. During this time, the public was asked to stay at home; only so-called system-relevant branches were allowed to

work outside of a home office; universities, schools, and kinder-gardens were closed; and people were advised to reduce their contacts to an absolute minimum and were allowed to meet with only one further person of a different household in public.

1.3. Pandemic Situation in Germany at the Time of the Study

We used this early pandemic situation in Germany as our paradigm: We asked citizens to report their compliance with currently imposed behavioral protection measures and investigated whether advice by a person of high authority (state secretary) versus low authority (social worker) in the sense of hierarchical leadership would increase endorsement of the behaviors. In addition, we varied the framing of the messages conveyed by the advisors: The authoritarian message argued with the law and referred to executive enforcement measures by the police, whereas the moralistic message argued with one's own responsibility for the community and oneself. A neutral control message with no particular framing was also included for reasons of comparison. We hypothesized that the authoritarian message would be most effective in influencing self-reported compliant behaviors, especially if sent by the high-authority figure.

Importantly, we determined participants' trait autonomy by established self-reported questionnaire items, and we asked whether it would interact with the experimental interventions. In line with the reactive component of our concept of autonomy, we predicted that individuals high in trait autonomy would show more consistent responses before and after reading the message; that is, they would resist the influences of the messages more than those low in trait autonomy. Hence autonomy should correlate negatively with the shifting (pre-post difference) in the responses due to the experimental interventions. We further predicted that this resistance against change would be higher (i.e., correlation less negative) for the authoritarian message sent by the high-status sender compared to that sent by the low-status sender because we envision autonomy to be directed not primarily against change in principle, but primarily against change imposed by powerful forces.

2. Materials and Methods

2.1. Participants

The survey was conducted in the early days of the COVID-19 pandemic response in Germany from 16 April 2020 to 20 April 2020. Participants were recruited either in collaboration with the panel Consumerfieldwork (http://www.consumerfieldwork.de (accessed on 19 July 2021)), $n = 300$, or via personal inquiries and social media. One hundred five students of Psychology at Goethe University Frankfurt participated for course credits. Panelists were rewarded according to their compensation agreement with Consumerfieldwork (M = EUR 0.80). We excluded participants who did not complete the whole survey ($n = 202$). All of these answered the two attention check questions (e.g., *"This is a question for attention control. Please check the second box from the left."*) correctly. We further excluded participants, who reported being under 18 or over 120 years ($n = 3$) of age, or who completed the survey in less than the median participation time multiplied by 0.25 ($n = 1$). The final data set consisted of $n = 707$ participants (454 female, no diverse), who finished the survey in $M = 10.4$ min. Age ranged from 18 to 85 years; $M = 37.56$ ($SD = 17.75$). Participants reported no school leaving degree (one person), school leaving certificate (5%), secondary school leaving certificate (15%), A-levels (37%), trained profession (20%), or university/college degree (23%) as highest achieved educational degree.

2.2. Design, Procedure, and Measures

The design was a mixed factorial design involving within-participants effects (pre- vs. post-intervention) and the between-participants factors leadership status (high for *state secretary*, $n = 354$, and low for *social worker*, $n = 353$) and message framing (authoritarian, mboxemphn = 233, vs. moral, $n = 238$, vs. none, control, $n = 236$). Participants were randomly assigned to one of the six between-factor groups.

The experiment was performed online. In the pre-intervention measurement, seven behavioral items were presented about social distancing behaviors in accordance with current governmental regulations in Germany at the time (see Table 1). Next, participants answered 22 items assessing autonomy as a personality trait, chosen to reflect our conception of autonomy as consistent responding despite social influences (McDonald's ω = 0.81, see Supplementary Materials Table S1 for list of items). Of these, 10 items were taken from the Moral Agency Scale [21], e.g., "*In most cases, I can make my own decisions about what is right or wrong in a situation*"; 6 items were adapted from the Trier Personality Questionnaire [22], e.g., "*I like to go my own way*"; and a further 6 items were adapted from the protective social comparison scale [23], e.g., inverted item "*My behavior often depends on how I feel others wish me to behave*". Thereafter, the experimental treatment was provided. Participants were shown a Twitter post (the post was fictitious, but this was unknown to them) that varied between groups of participants by sender and message framing (Figure 1). Next, a memory check was administered. One was a multiple-choice question asking about the occupation of the sender of the post, and the other asked about the reasoning used in the message. Because only 479 of the 707 answered both these items correctly, we refrained from excluding any of the participants based on this check. The participants also rated the senders' trustworthiness and the senders' morality. They were then given the seven items on the social distancing behaviors again in the post-treatment measurement. We also displayed the moral and the authoritarian message to the participants and asked for the effectiveness of the two messages. Finally, we asked participants five questions rated on a 5-point-Likert-scale: how much they felt the pandemic to be a threat for society, for themselves personally, and for their close social environment and how they evaluated their personal risk and the risk to their close social environment. We also assessed whether the participants themselves or someone in their households had tested positive for COVID-19 or people in their direct environment had tested positive. At the end, after answering demographic questions about their person, participants were thanked and debriefed. All participants provided informed consent, and the study was approved by the institutional ethics board of our faculty.

Table 1. Behavioral pre- and post-intervention measures as presented in the survey.

Item	
1	I reduce contact with other people outside the apartment to an absolute minimum.
2	I keep a minimum distance of 1.5 m to other people in public wherever possible.
3	I only spend time in public alone, with members of my household, or with one other person.
4	There are only very limited reasons for me to leave the house: emergency care, important purchases, doctor's visit, necessary work, meetings, exams, sport, physical activity.
5	I wear a protective mask when I am in other indoor rooms.
6	For as long as schools and kindergartens are closed, I prevent my children from having any contact, or I would do this if I had children.
7	I abstain from personal contact with older relatives and persons at risk.

2.3. Statistical Analyses

The mean ratings of the seven behavioral safety measures taken before and after the manipulation and the ratings of the 22 autonomy items were computed. We computed the pre-post difference by subtracting the post-intervention value from the pre-intervention value for each item and each person. For analyses involving trait autonomy, we used the absolute pre- and post-intervention values because our hypotheses referred to the extent of the shifting between pre- and post-intervention measurement, not the direction of the shift. Inferential statistical analyses were performed in line with the preregistration [24] as follows:

Analysis 1. We conducted an ANOVA on the average responses across all 7 pre-intervention measurement and post-intervention measurement questions. This was a 2 (pre-post) × 2 (author (=sender)) × 3 (message framing) factorial design [24]. However, because this analysis yielded no significant experimental effects other than a significant pre-post difference (see Section 3), presumably due to ceiling effects on many of the items, we inspected the effects at the level of single items and found that Item 5 did not show such ceiling effects. We, therefore, analyzed responses to Item 5 separately using the same ANOVA.

Analysis 2. We correlated the average score of the 22 trait autonomy questions with the pre-post difference across all questions in all 6 groups. Additionally, we analyzed the pre-post difference by multiple regression analyses using trait autonomy and authoritarian treatment (leadership status (=sender) and message framing) as a predictor [24].

Analysis 3. "To rule out floor/ceiling effects (response rates below 0.20 or above 0.80), we will repeat the analyses using only items with response rates between 0.20 and 0.80 (averaged across all groups)", quoted from [24]. There is a mistake in the wording of the dependent variable in this section: It refers to "response rates" where it should refer to "ratings". Because we did indeed find a reason to suspect the presence of ceiling effects, we dropped ratings above 0.80 of the Likert scale in the pre-treatment measure (i.e., values that were already maximal to begin with), then calculated the pre-post differences of each participant using only the remaining items, and repeated the ANOVA described in analyses 1 and 2.

Explorative Analysis. Social demographic values are assessed in the Supplementary Materials in Tables S2 and S3.

Analyses were performed with the programming language R-4.1.0, using RStudio (version 1.4.1106); the significance level was set to $p = 0.05$.

Figure 1. Twitter messages (translated to English) in three framings (from left to right: authoritarian message framing, moral message framing, and neutral message framing for control) sent by the state secretary (authoritarian sender); the social worker had the same photograph.

3. Results

3.1. Manipulation Check and Descriptive Results

Participants rated the senders' trustworthiness in the state secretary group ($M = 3.34$, $SD = 0.97$) significantly lower than that in the group with the social worker as sender ($M = 3.45$, $SD = 0.92$; $t(703.28) = -1.65$, $p < 0.049$). The same effect was found for morality: the state secretary ($M = 3.63$, $SD = 0.87$) was rated significantly less moral compared to the social worker ($M = 3.96$, $SD = 0.81$; $t(701.33) = -5.15$, $p < 0.01$). Participants rated the moral/prosocial message ($M = 4.27$, $SD = 0.91$) as significantly more effective than the authoritarian/controlling message ($M = 3.14$, $SD = 1.29$; $t(706) = -19.81$, $p < 0.01$).

On average, participants reported the pandemic to be more of a threat for society (*M* = 3.80, *SD* = 0.93) and for their close social environment (*M* = 3.74, *SD* = 1.11) than for themselves personally (*M* = 2.65, *SD* = 1.30). The difference between personal threat and societal threat was significant (*t*(706) = −24.36, *p* < 0.01), as was the difference between personal threat and threat for the close social environment (*t*(706) = −22.26, *p* < 0.01). Furthermore, participants perceived themselves much less as part of a high-risk group (*M* = 2.19, *SD* = 1.47) than they did the people in their households (*M* = 2.73, *SD* = 1.61; *t*(706) = −8.77, *p* < 0.01).

In their direct environment, 104 participants reported positive cases, 522 participants reported no positive cases, and 81 reported being uncertain. Four participants had tested positive, four more reported persons testing positive in their households. 43 participants reported symptoms but had not been tested, and this was the case for 15 persons in the households of participants. 641 people reported no symptoms or positive tests for themselves or their households since the start of the pandemic.

3.2. Main Analyses

Analysis 1. The main ANOVA found a small but significant effect of the repeated measures factor. The average pre-intervention rating across all seven items (*M* = 4.07, *SD* = 0.68) was significantly lower than the post-intervention rating across all seven items (*M* = 4.14, *SD* = 0.71; *F*(1, 701) = 19.55, *p* < 0.001, η^2 = 0.002). No other effects were significant.

Exploratory Analyses. Average pre-intervention rating values were above 4; in fact, 2768 out of 4949 pre-intervention ratings (56%) were at the maximum value of 5 to begin with. Therefore, we inspected results at the single-item level and noticed that Item 5 was the only one that was far away from showing such ceiling effects. The item asked about wearing a mask in public indoor spaces, a measure that was not common at the time of the survey and was in fact not officially recommended yet. We thus explored the effects of our experimental manipulations on this item alone. As shown in Figure 2, participants endorsed wearing a mask in public indoor spaces much more after the intervention (*M* = 2.79, 95% CI [2.68, 2.91]) than before (*M* = 2.23, 95% CI [2.12, 2.34]; *F*(1, 701) = 220.662, *p* = 0.03, η^2 = 0.034). No other effects were significant. The sender x message interaction was at *F*(2, 701) = 1.144, *p* < 0.32, η^2 = 0.003. Results and graphs for the other items are shown in Supplementary Materials Table S4 and Figures 1 and 2.
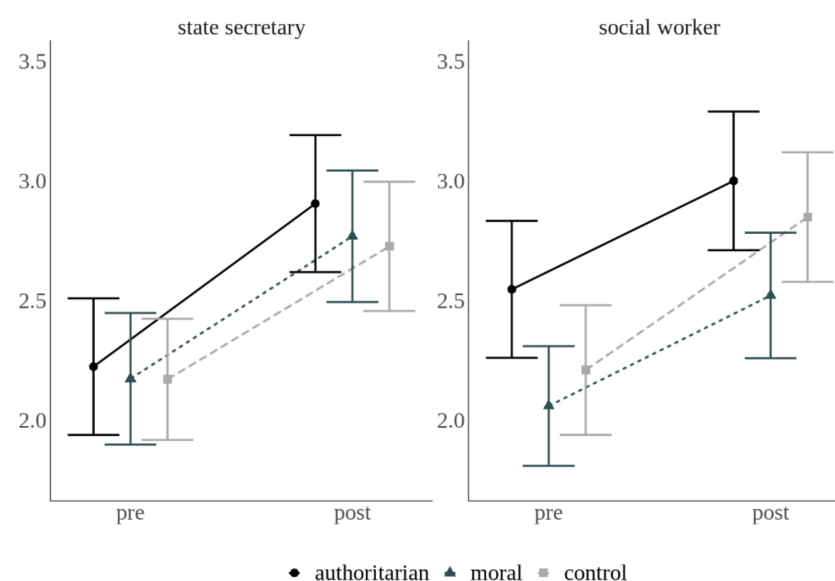

Figure 2. Mean ratings (95% CI) in response to Item 5, asking about wearing a mask in public indoor spaces, before (pre) and after (post) the message intervention.

Analysis 2. Across all seven items, bidirectional pre-post differences did not correlate significantly with trait autonomy (Spearman's $r(705) = -0.04$, $p = 0.23$). The same holds for treatment-group-specific correlations of the bidirectional differences with autonomy (see Supplementary Materials Table S5).

More importantly, however, absolute differences between pre- and post-intervention ratings across all seven items did correlate significantly negatively with trait autonomy (Spearman's $r(705) = -0.18$, $p < 0.01$). This means that the more the rating shifted from pre- to post-intervention (regardless of the direction of shift), the lower the trait autonomy scores. Treatment-group-specific correlations are provided in Table 2. The negative correlation is most pronounced for the social worker with both the authoritarian message and the moralizing message.

Table 2. Spearman correlations between trait autonomy and absolute pre-post difference across all seven items for the 3×2 treatment groups.

	High Authority: State Secretary	Low Authority: Social Worker
authoritarian	$r = 0.08$ (116), $p = 0.41$	$r = -0.25$ (117), $p = 0.01$
moral	$r = -0.15$ (121), $p = 0.10$	$r = -0.30$ (117), $p < 0.01$
control	$r = -0.15$ (117), $p = 0.11$	$r = -0.12$(119), $p = 0.19$

Note. *p*-values are Holm adjusted for multiple tests.

The linear regression analysis tested these variations for statistical significance. Results showed that there was no overall effect of trait autonomy in predicting absolute pre-post differences ($b = -0.04$, 95% CI $[-0.25, 0.16]$, $t = -0.42$, $p = 0.68$). However, sender was a significant predictor ($b = 1.23$, 95% CI $[0.20, 2.27]$, $t = 2.34$, $p = 0.02$), as was the interaction of sender x autonomy ($b = -0.33$, 95% CI $[-0.61, -0.04]$, $t = -2.37$, $p = 0.03$). Table 2 reveals the source of this interaction effect. The pre-post rating shifts were antagonized by autonomy more strongly in the social worker treatment group than in the state secretary treatment group. The interaction of sender x message (control) $\times$ autonomy was marginally significant ($b = 0.38$, 95% CI $[-0.04, 0.79]$, $t = 1.792$, $p = 0.07$), suggesting that the group of participants receiving the authoritarian message from the high-authority figure showing a correlation of $r = 0.08$ (see Table 2) deviated slightly from the other treatment groups showing negative correlations between -0.12 and -0.30. Message framing or any of the other interactions showed no significant predictions (see Supplementary Materials Table S6 for the full regression table). Together, the predictors explain a small, but significant, portion of variance ($R^2 = 0.041$, 95% CI $[0.01, 0.06]$, $F(1, 695) = 5.37$, $p < 0.002$).

3.3. Analysis 3: Reanalyses Controlling for Ceiling Effects

All items with pre-intervention ratings of 5 were eliminated from these analyses, excluding a total of 2768, out of 4949 pre-intervention ratings (56%) (see Supplementary Materials S4 for item specific sample size with correction of ceiling effect).

Reanalysis 1. Again, the main ANOVA found only a significant effect of the repeated measures factor. The average post-intervention rating across all seven items ($M = 3.27$, $SD = 0.96$, $n = 656$) was significantly higher than the pre-intervention rating across all seven items ($M = 2.79$, $SD = 0.85$, $n = 656$; $F(1, 650) = 1048.60$, $p < 0.001$, $\eta^2 = 0.41$), this time with a large effect size. Message, sender, and all of the interactions did not show any significant effects. Message, sender, and interactions were not significant.

Reanalysis 2. Trait autonomy scores did not correlate significantly with bidirectional pre-post differences across all seven items (Spearman's $r(652) = 0.01$, $p = 0.71$) but did correlate marginally significantly with the absolute pre-post differences across all seven items (Spearman's $r(652) = -0.07$, $p = 0.06$). Treatment-specific correlations were not significant (Supplementary Materials Tables S7 and S8). The linear regression showed no significant interactions in this reanalysis (see Supplementary Materials Table S9 for the full regression table).

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4. Discussion

Situated in the early months of the COVID-19 pandemic in Germany, we assessed common approval of health and safety regulations ordered by the government. We experimentally varied the framing and the sender of a fictitious social media post on Twitter promoting the regulations. We asked, firstly, whether an authoritarian sender and authoritarian framing would increase approval ratings (compared to moral and neutral control variants, respectively) and, secondly, whether this relationship would interact with trait autonomy of the recipients. In the spirit of open science, all our analyses were conducted as preregistered, and additional analyses are presented as exploratory analyses and supplementary materials.

Across all treatment groups (i.e., all experimental manipulations of message framing and sender) and averaged across all seven items, we found that the Twitter messages significantly increased endorsement of the rules. However, despite being significant due to the large sample size, the effect was very small on average, explaining only 0.2% of the variance. This was caused in part because many of the ratings actually decreased from before to after the intervention, to our surprise; we thought at first that this may have been due to reactance effects in response to some items, especially those mentioning the "home", namely items 1, 3, and 4 (see Supplementary Materials Figure S1 for detailed graphs per item).

Another reason for the small size of the increase from before to after the intervention was the obvious presence of ceiling effects. This was not entirely unexpected (see preregistration, Analysis 3) as the same had been observed in prior studies investigating moral message framing on behavior during the COVID-19 pandemic where intervention effects are too small to pass the conventional levels of statistical significance [25]. During the early pandemic, when this survey was conducted, people were highly concerned and therefore willing to invest quite a lot into preventing the spread of the disease, as our findings showed. In many cases, their investments qualify as prosocial acts, maximizing joint welfare in the terminology of the social value orientation (SVO) framework [26], because they serve to protect the welfare of all, including oneself and others. Some measures, however, like wearing a mask, are more of an altruistic sacrifice whose purpose is merely to protect others [27,28]. We find it reassuring and praiseworthy that so many participants endorsed these regulation measures in a situation that was new to everyone, while protection measures severely restrained private rights and personal autonomy to a high degree. Participants of our study even reported more concerns for others than they did for themselves. Further promotion of this attitude via social media messaging was simply not needed for most measures (except for the new advice of mask-wearing).

In a statistical sense, the high level of endorsement was a problem because ceiling effects dampen the upward effects of experimental manipulations on prosocial/moral choice [29] and elsewhere. In fact, we did not observe any significant effects of our experimental manipulations in the analyses that did not consider individual differences in autonomy. To account for the problem, we reanalyzed the data in two ways. First, we eliminated all items with the maximum rating of 5 in the pre-intervention measurement and ran all analyses again. Second, we looked into the one item that appeared to show no ceiling effect (Item 5). This item referred to "wearing a mask in public indoor spaces", which at the time of the survey had been completely voluntary; the official policy was still that there is not enough evidence to prove that wearing a mask significantly reduces a healthy person's risk of infection, and the World Health Organization (WHO) presumed that wearing a mask might even create a false sense of safety and therefore lead to neglecting other hygiene measures [28,30].

In both reanalyses, we found large pre-to-post increases. First, averaged across all groups and across all seven items in the subset of data in which the ceiling effect had been statistically minimized, the pre-post measurement effect explained 41% of the variance (formerly 0.2%). Second, in Item 5, the pre-post measurement effect was also highly significant and went into the expected direction in all groups. The same was true for all

other single items with statistically controlled ceiling effects (see Supplementary Materials Table S4 and Figure S2). In addition, no seemingly "reactant" behavioral pattern was observed anymore in any of the groups.

However, despite this clearly positive impact of the intervention overall, our experimental manipulations failed to show any statistically significant effects. Therefore, we conclude that the effects of the message framing and of the authority status of the sender were not significant in our sample, independent of any potentially dampening ceiling effects.

What we did find though were significant effects of self-reported trait autonomy, and interactions of trait autonomy with the experimental manipulations. Across all groups, autonomy scores correlated negatively with the absolute pre-to-post intervention differences, meaning that the higher participants' autonomy, the less they shifted upwards or downwards in their decision-making between the two rating measures. In other words, individuals high in trait autonomy resisted changing their ratings after reading the message more than those low in autonomy.

Conversely, individuals low in autonomy shifted in their ratings more than those high in autonomy, both in accordance with the message and in opposition to it. This pattern is consistent with the idea of reactive autonomy, which describes autonomy as nonconformist resistance against social influences [15–18]. However, the relationship was larger in response to the social worker's message than in the case of the state secretary, as suggested by the significant negative interaction of trait autonomy and sender (social worker) in the regression analysis. Perhaps this condition felt lenient enough to let individuals low in autonomy allow themselves to vary their decision-making, while those high in autonomy tended to stick to their prior ratings. The authoritarian sender, by contrast, led to more uniform decision-making across all participants, regardless of trait autonomy.

In other words, the social worker, compared to the state secretary, may have increased diversity in opinion shifting, especially in the "downward" direction because the correlations were weaker for the bidirectional pre-post difference than for the absolute pre-post difference. Our manipulation checks indicated that the social worker was seen as more moralistic and more trustworthy than the state secretary. Trust and source credibility have been found before to enhance the effects of health-promoting messages in the context of the COVID-19 pandemic [31–33]. In our case, however, the trustworthiness and morality of the sender did not increase overall endorsement to the items, but they did interact with autonomy by unleashing higher variation in pre-to-post rating shifts, perhaps due to the involvement of positive emotions and the reduction in fear [32–34].

While we have focused on status, authoritarianism, and autonomy in the present study, we note that other features of sender, message, and recipient are likely to interact in determining the effects of health communication. In particular, the recipients' sociodemographics and personality traits, other than reactive autonomy, influence perception and receptivity. One of the most important variables may be age. Older adults might prefer information through newspapers and national evening television, whereas young people prefer information through social media [35]. Further, it is likely that more authoritarian message framings and sender status can be found in the former, whereas the social media typically address recipients in a more colloquial way. This is no unidirectional relationship because recipients choose their sources, and sources in turn shape the communication preferences (and communication skills) of recipients. Eventually, the match between recipient, sender, and message framing may be the most crucial factor. The present study has selected only a fraction of the variables that can be considered when communication efficiency is sought to be optimized by more tailored approaches.

One major limitation of our study is the problem of generalizability. First, the study was conducted in only one of the so-called WEIRD countries, namely Germany. For autonomy in particular, the cultural dimension of individualism may play a formative role [36]. However, differences in vertical versus hierarchical orientation can also have a major influence on submission to authorities. At present, our findings are indifferent to such

variation and need comparison with different societal and cultural contexts. Second, the study was conducted in the early days of the pandemic, and it was still an extreme situation for most people, which might have influenced the generally high approval rates for the regulations. We would presume that a higher degree of uncertainty makes inter-individual differences in autonomy even more influential, as in the case of Item 5.

The major strength of this study might be the new approach to measuring reactive autonomy using an experimental measure in conjunction with a self-report measure. In past experimentally oriented studies, researchers often struggled to make autonomy, in the sense of resistance to external or internal influences, measurable [37]. The challenge goes back to the complexity of defining autonomy in a uniform way: the concept of reactive autonomy [14–16] and its relation to self-regulative, reflective components of autonomy [17,18]. Additionally, from a feminist perspective, autonomy can be complemented by communion [38], which could be especially insightful in prosocial contexts like COVID-19 social distancing measures.

The present study contributes a new approach to evaluating autonomy by focusing on its merely reactive meaning as resistance to external influences (in this case, social media communication). Beyond that, developmental differences during the lifespan, the motivational background of autonomous decision-making, and differences between cultures or societies are to be illuminated in future research. Furthermore, internal influences such as motivation and emotions (e.g., guilt/shame) might play a role in health communication where protecting others from the disease and also fear of getting infected oneself might drive attitudes and behaviors.

Methodologically, our results can help to improve future surveys on related issues. First, the intervention effects were small—a problem that has also appeared in prior moral messaging studies during the COVID-19 pandemic [25,27]. Using a visual analog scale (VAS) to measure behavior instead of a Likert scale will increase the resolution of the dependent measure and might help to prevent ceiling effects. In addition, transfer effects might be reduced, as it is easier to remember a number between 1 and 5 from pre- to post-intervention rating than a detailed position on a VAS.

Second, the informative results we obtained with Item 5 about wearing a mask suggest that future research should not only ask about measures that are prescribed by officials but should instead focus more on protective measures that people may still be unsure about. For low-autonomy individuals in particular, it might be difficult to form and express an opinion that challenges official directives that are already implemented. As in every area of decision-making research, uncertainty and ambiguity enhance the person-specific component of the decision-making process [39], and based on the present findings, we can add trust as an additional variable for social settings. Under prosocial premises, participants may be more willing and more able to develop and report large or small changes in their opinions.

5. Conclusions

The endorsement of health and safety regulations to protect against COVID-19 is generally high. Supporting public health communication via social media appears to have the strongest effect when there is some uncertainty about the effectiveness of the regulated behavior. Autonomous individuals tend to show more consistent endorsement of the regulations, whereas those low in autonomy allow their ratings to vary more in response to social messaging, especially when the sender has a nonauthoritarian social status and is trusted more. Disputed regulation measures are most susceptible to messaging interventions and their interactions with individual differences in autonomy. Future studies can build on these results in designing custom-tailored health communication to maximize its efficiency.

Supplementary Materials: The following materials are available online at https://www.mdpi.com/article/10.3390/ijerph18157740/s1, Table S1: Trait autonomy items and item source, Exploratory Analysis on socio-demographics in Table S2: Hierarchical regression results using absolute pre-post

differences (averaged across all seven items) as criterion, with correction of ceiling effects, Table S3: Hierarchical regression results using absolute pre-post differences for item 5 as the criterion (the one item that showed no ceiling effect), Table S4: ANOVA results on single item level, without and with correction of ceiling effects, Figure S1: Mean ratings (95% CI) in response to single items, without correction of ceiling effects, Figure S2: Mean ratings (95% CI) in response to single items with correction of ceiling effects, Table S5: Spearman correlations between trait autonomy and average bidirectional pre-post difference (averaged across all seven items) for the different senders (high and low authority) and message types, without correction of ceiling effects, Table S6: Regression results using absolute pre-post differences (averaged across all seven items) as the criterion, without correction of ceiling effects ($R^2 = 0.04$, $F(11, 695)= 2.72$, $p < 0.01$).Table S7: Spearman correlations between trait autonomy and absolute pre-post difference (averaged across all seven items) for the different senders (high and low authority) and message types, with correction of ceiling effects, Table S8: Spearman correlations between trait autonomy and bidirectional pre-post difference (averaged across all seven items) for the different senders (high and low authority) and message types, with correction of ceiling effects, Table S9: Regression results using absolute pre-post differences (averaged across all seven items) as criterion, with correction of ceiling effects ($R^2 = 0.01$, $F(11, 644) = 0.01$, $p = 0.75$).

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Article 3: Assessing Behavioral Autonomy in Resistance to Descriptive Norm Feedback

Assessing Behavioral Autonomy in Resistance to Descriptive Norm Feedback

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Abstract

Psychological experiments that define the concept of autonomy in behavioral terms are scarce. Here, we operationalized reactive autonomy in the sense of behavioral resistance against the influence of the (manipulated) descriptive norm. We also investigated whether a self-developed six-item short trait scale measuring self-reliance and other-reliance can predict the likelihood of showing such behavioral resistance. Participants responded to 26 trials consisting of general knowledge and spatial reasoning items in a multiple-choice format before and after receiving bogus feedback about the response distributions of prior participants. In 50% of the trials, the feedback showed a bar chart distribution in which the participant's answer represented the minority choices. We call this feedback "incongruent". In the other 50% of the trials, the participant's response was "congruent" with the majority of responses (distraction trials). Participants were then given the opportunity to alter ("shift") their responses. We conducted Study 1 online, $N = 392$, and Study 2, in the laboratory, $N = 93$. In both studies, participants shifted significantly more often in when they received incongruent feedback relative to congruent, and their decision confidence decreased significantly. Also, in both studies, cross-classified multilevel models found that on trial-level, the initial correctness of participants' initial responses and their initial confidence decreased the probability of shifting. The same holds for the initial correctness on the person-level. Interestingly, in both studies, other-reliance increased with the probability of shifting. However, in the online study, other-reliance was only meaningfully related to the probability of shifting when including participants in the analyses who admitted to having looked up the correct answers. In Study 1, non-shifters, the reactively autonomous individuals, showed no meaningful differences in their self-reliance, other-reliance, or need for cognition compared to non-shifters. However, in Study 2, for the spatial reasoning task, we found that non-shifters had significantly higher scores in self-reliance and self-awareness and significantly lower scores on other-reliance and susceptibility to control scales than shifters. In summary, we have introduced resistance against normative influence as one example of reactive autonomy that can be measured in lab experiments. Additionally, we provide evidence on the trait profile of reactively autonomous individuals as identified by this paradigm.

Keywords: autonomy, self-reliance, other-reliance, descriptive norm, influence, feedback

ASSESSING BEHAVIORAL AUTONOMY IN RESISTANCE TO DESCRIPTIVE NORM FEEDBACK   3

Understanding and resisting social threats, including the effects of populism and mass manipulation, requires autonomous thinking and behavior. Hence, individual autonomy (Greek αυτόνομος: 'auto' self and 'nomos' law), defined as the ability to be steadfast under pressure and to stand by one's own values, is of great importance.

Scholars distinguish between *reactive* and *reflective* autonomy (Koestner & Losier, 1996). Reactive autonomy means resisting external influence, especially from an interpersonal perspective. This understanding relates closely to the classical concept of autonomy as separation and independence of others (Erikson, 1998; Kohlberg, 1981; Mahler et al., 1975) and elicited criticism from subsequent scholars (Bekker & van Assen, 2006; Chirkov et al., 2003; Hmel & Pincus, 2002). By contrast, reflective autonomy is focused on intrapersonal processes, in the sense of self-governing or self-regulation, as formulated in Self-Determination Theory (Ryan et al., 2021a; Ryan & Deci, 2006).

Not only is autonomy essential in resisting external influences, but it also plays a unique role in the context of well-being across cultures and gender (Chirkov et al., 2003). For example, in three studies, Koestner and colleagues (2012) found that autonomy support was positively related to goal progress, improved relationship quality, and subjective well-being. Furthermore, Gagné and Bhave (2011) define autonomy as essential to employee engagement and well-being. Also, at the workplace, high autonomy in teams, when having goal clarity, leads to high performance (Gonzalez-Mulé et al., 2016). Moreover, well-being, as part of life satisfaction, is closely related to autonomy (Kukita et al., 2022; Rudy et al., 2007). Additionally, a meta-analysis conducted in all East Asian countries and the US supports a stable, moderate link between subjective well-being and autonomy (Yu et al., 2018). While others even discuss whether pursuing autonomy is universal (Li et al., 2022).

Nonetheless, scholars rarely address autonomy from a behavioral standpoint (Swann & Jetten, 2017). Instead, experimental psychology has typically focused on its opposites, compliance and conformity (Asch, 1961; Bostyn & Roets, 2017; Cialdini & Goldstein, 2004; Kundu & Cummins, 2013; Milgram, 1974; Wijenayake et al., 2020). Yet, despite its importance to human experience and its widespread use in the literature, autonomy is a construct that lacks theoretical homogeneity and consistent operationalization (Hmel & Pincus, 2002). Hence, we need more experimental research on autonomy in the sense of resistance to external or internal influences. Therefore, in the present studies, we intend to find new approaches to the behavioral assessment of autonomy. Additionally, we used this experimental measure in conjunction with a self-report measure. In the following, we explain and justify the operationalization of behavioral and self-reported autonomy.

Measuring Autonomy Experimentally

To measure autonomy experimentally, we focus on reactive autonomy as the resistance to external influences and orientation to act (Koestner & Losier, 1996). Reviewing the conformity and compliance literature, one finds many different ways to operationalize external influence on behavior and decision-making. For the following experiments, we decided to use descriptive social norm influence. Social norms include essential information for humans on how one should behave or how others usually behave and, therefore, have been used in conformity and compliance experiments (Cialdini & Goldstein, 2004). Among the affected behaviors are donations (Agerström et al., 2016) and environmentally friendly behavior (Farrow et al., 2017; Nolan et al., 2008; Schultz et al., 2007). In addition, Wijenayake and colleagues (2020) used a descriptive norm bogus feedback to investigate compliance in online settings.

Similarly, Bostyn and Roets (2017) applied bogus feedback on decision-making in trolley-type moral dilemma scenarios. They found an asymmetric conformity effect where participants would rather conform to deontological than consequentialist majorities. However, one potential critique of this approach was the missing within-person comparison since they only compared the compliance rates between groups. Thus, in the present study, we chose a pre-/post-feedback measurement design to assess the within-person changes in behavior due to feedback.

In a former study, we investigated the influence of message framing, in the form of a social media post, on reported social distancing behavior using a within-person design (Zey & Windmann, 2021). Message framing targets not only a message's content but also the how it is delivered to the audience. Tversky and Kahneman, (1981) were the first to find large and systematic changes in decision preferences by seemingly minor modifications in the phrasing (framing) of choice issues. Participants saw one of three different types of message framing for the tweets (authoritarian/controlling, moralizing/prosocial, or neutral), authored by either a high-authority sender (secretary of state) or a low-authority sender (social worker). We found that social distancing behavior was extremely high under the exceptional circumstance of the early times of the COVID-19 pandemic. For most items, the compliance was already at the highest level at the pre measurement. So our manipulation failed when trying to influence social distancing behavior. Importantly, we found one exception, namely, wearing protective masks. Back then, German regulations had not yet enforced the use of protective face masks, which was, in fact, a controversially discussed issue. For this item, the message framing did influence the behavior intentions significantly. We argued that this could be due to the moral nature of the questions, which could also depend on the subjective evaluation of risk. Therefore, in the

current study, we refrained from moral questions but instead relied on factual intelligence items for which objectively correct answers exist. Wijenayake and colleagues (2020) used objective and subjective items to study online conformity and the impact of contextual and personality determinants. Participants' initial answer was positioned in a fabricated bar chart's relative majority or minority in the feedback. The authors found that 78% of the participants shifted their answers at least once to the majority's answers.

In Wijenayake and colleagues' (2020) data, the tendency to conform was significantly enhanced in three cases: first, when answering objective items; second, when a participant was unsure of their answer; and lastly, when seeing an opposing majority with significant size. Moreover, the authors found that individuals high in conscientiousness and neuroticism tended to conform more frequently than others.

In the present studies, we take the change in responding from pre- to post-feedback as a behavioral manifestation of reactive autonomy. Each trial, where a person changes their answer after seeing the feedback, is considered a "shift" in responding. Therefore, we call persons who shift their response at some point in the two task-types after the feedback *shifters*. The persons sticking to their initial answers after each feedback are called *non-shifters*. We consider non-shifters as reactively autonomous individuals. In addition, a gradual shift measure is reflected in the total count of response changes in the experimental trials between pre and post-feedback, taken separately for each task type (knowledge vs. reasoning) and type of feedback (congruent vs. incongruent).

Lastly, past research indicates that participants unsure of an answer can be influenced more easily (Laporte et al., 2010; Wijenayake et al., 2020). Consequently, we wanted to use items with great difficulty and high uncertainty. In a preceding pilot study (N = 29), we had tested 36 items of two intelligence tests: 15 Raven's matrices (Raven, 2019) and 21 knowledge questions of the IST 2000R (Liepmann, Detlev et al., 2012). Participants responded to the items and indicated how certain they were about each answer on an eight-point Likert scale (1 = very uncertain, 8 = very certain). Therefore, based on item difficulty and certainty, we selected 16 general knowledge and ten spatial reasoning items for the present studies.

Self- and Other-Reliance Questionnaire

Most autonomy measures focus on a reflective or motivational definition of autonomy (Anderson et al., 1994; Bekker & van Assen, 2006; Deci & Ryan, 1985; Guerra & Giner-Sorolla, 2010; Weinstein et al., 2012). In order to combine autonomy with the experimental measurement of reactive autonomy, we developed the construct of *self-reliance* and *other-reliance,* describing reference to internal (self) and external (other) agents during decision-

making. We started with a selection of 12 items from two existing questionnaires. First, we adapted six items of the autonomy scale from the Trier Personality Questionnaire (Becker, 1989), e.g., "I like to go my own way". We used the other six items of the protective social comparison scale (Laux & Renner, 2002), e.g., an inverted item, "My behavior often depends on how I feel others wish me to behave". Factor analysis and item selection yielded a two-factor scale with three items per factor: the self- and other-reliance scales. For more details on the scale construction process, see additional materials[1]. Self-reliance can be understood as the tendency to trust one's own thinking and intuition. By contrast, other-reliance describes the preference to trust the evaluations of others more than one's own.

Related Concepts

In order to think and act autonomously, individuals need the ability and willingness to think for themselves. Therefore we expected a connection of autonomy to the need for cognition, which Cacioppo and Petty (1982) and Cohen and colleagues (1955), described as the tendency to find fun in thinking and the need to structure information in meaningful and integrated ways*.

Additionally, we wanted to examine the relation of self- and other-reliance to established autonomy trait scales. Due to the heterogeneity of autonomy definitions, various ways of operationalization and scales exist (Anderson et al., 1994, 1994; Bekker & van Assen, 2006; Deci & Ryan, 1985; Gough & Heilbrun, 1983; Graceffo et al., 2014; Guerra & Giner-Sorolla, 2010; Hmel & Pincus, 2002; Weinstein et al., 2012). We were especially interested in the link of reflective autonomy measures that distinguish between self- and other-reliance.

Therefore, first we selected *index autonomy functioning* (IAT, Weinstein et al., 2012), a conceptualization of dispositional autonomy, based on Self-Determination Theory (Deci & Ryan, 2012; Ryan et al., 2021b). We picked the IAT for for its definition of autonomy as self-governance. Accordingly, persons high in dispositional autonomy originate their actions, or they approve of them, and thereby they experience their actions as self-congruent and self-initiated.

Second, we chose an approach that builds on the notion of autonomy as self-governance but also highlights interdependent aspects of autonomy as a construct of an individual in relationship with others. *Autonomy-connectedness* (ACS, Bekker & van Assen, 2006) deviates from the classical perspective considering the interdependent nature of human beings and gender-related individual differences. It can be described as "the capacity to be on one's own as well as to be with others" (p.52, Bekker & van Assen, 2006).

Lastly, previous literature found other autonomy concepts connected to the Big Five

[1]Open Science Framework "Scale construction: self- and other-reliance" https://osf.io/6m3eg/

(Hmel & Pincus, 2002; Koestner & Losier, 1996; Weinstein et al., 2012), inspiring us to assess this in an exploratory manner.

Purpose of the Present Studies

We addressed the following goals using two consecutive studies: an online study (Study 1) and a systematic replication study (Study 2) which we performed in our laboratory to control for confounding factors, especially the possibility of looking up general knowledge items online while responding to the questionnaire.

In the present studies, we examined the resistance to descriptive norm feedback while responding to factual items. Study 1[2] and Study 2[3] were preregistered before data acquisition. We pursued four primary goals:

First, we ask how situation-specific variables like participants' initial confidence, feedback correctness, or task type influenced the probability of shifting. Secondly, we looked into the factors indicative of the probability of shifting after learning that one's answer is incongruent with the majority's answer. Hence, we ask whether experimental autonomy (not-shifting) can be explained by self- and other-reliance. Next, we investigated how the non-shifters differ in self- and other reliance from the shifters. In Study 1, we also checked for differences in need for cognition, and in Study 2, for differences in autonomy-connectedness and index autonomy functioning. Lastly, we investigated the relationship between self- and other-reliance and other constructs. In Study 1, we examine the association of self- and other-reliance to need for cognition. Study 2 focuses on the association between self- and other-reliance and autonomy-connectedness, index autonomy functioning, and the Big Five.

Study 1

Method

Participants

From March 3rd to March 13th, we collected 405 completed questionnaires in an online study through the commercial panel Consumerfieldwork GmbH (2022). We used age, gender, and education quotas to aim for a representative sample of German participants. As preregistered, we included only persons responding correctly to the two attention check items, yielding 404 participants. Additionally, we checked for answer patterns. Due to missing variance in their response to trait items or confidence ratings, we excluded 12 participants. The final data set we report here consists of $N = 392$ participants (205 female, 184 male, and three non-

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[2] Open Science Framework preregistration: https://doi.org/10.17605/OSF.IO/C67WR
[3] Open Science Framework preregistration: https://doi.org/10.17605/OSF.IO/4GVK6

binary). Participants' age ($M = 50.87$, $SD = 16.62$) ranged from 18 to 91 years. They reported no school leaving degree (1%), school leaving certificate (27%), secondary school leaving certificate (33%), A-levels (18%), other school leaving degree (4%), or university/college degree (18%) as the highest level of education attained. However 106 participants admitted at the end of the survey that they had looked up questions during the study. Therefore we repeated our analysis excluding these participants, keeping $n = 285$ (see Supplemental Materials S1). We indicate in the script, whenever the results of the reanalysis differ from the results of the whole sample.

Procedure

The online experiment was set up in SoSci Survey (Leiner, 2019). Participants gave written informed consent before data collection and the ethics committee of our faculty at Goethe University Frankfurt approved both studies (Reference number: 2021-36, Jun 24th, 2021). On average, responding to the questionnaire took $M = 24.95$ minutes. First, the participants responded to 26 experimental trials using multiple-choice items. Next, they answered trait questionnaires and, in the end, demographic questions. The trait questionnaire part in Study 1 consisted of a self-developed six-item scale to measure self-reliance and other-reliance and the Rational-Experiential Inventory (Epstein et al., 1996) for need for cognition.

Experimental Task Design. Participants responded to 26 trials in multiple-choice format: 16 general knowledge and ten spatial reasoning items. The experimental trials were preceded by three spatial reasoning practice tasks to familiarize the participants with the task. Participants could continue the questionnaire, after these were solved correctly. In randomized order, each of the 26 trials consisted of a first initial decision (pre-feedback) and a second decision with feedback (post-feedback), as illustrated in Figure 1.

Figure 1

Example Trial of the General Knowledge Task as seen by Participants, including Feedback displayed above the 2nd Decision and Confidence Ratings taken for Both Decisions
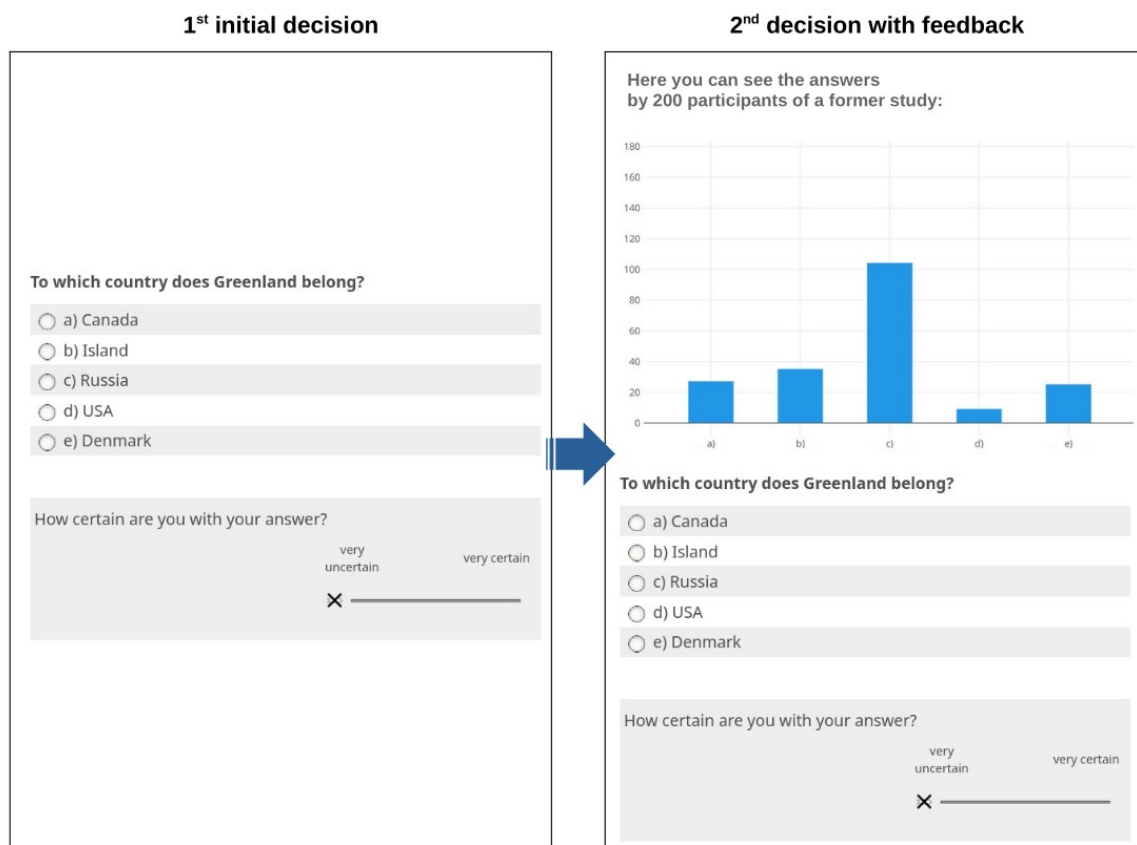
When the second decision was requested, participants saw other participants' responses (descriptive norm) allegedly gathered in a prior study. The nature of the feedback depended on the participant's first response in the trial: in 50% of the trials, the bogus feedback was incongruent with the initial response of the participants, meaning they saw a distribution whose peak was inconsistent with their own decision. By contrast, the feedback was congruent with the initial response of the participants in the other 50% of the trials (i.e., distractor trials) to disguise the aim of the study. Additionally, we measured the confidence about each response at both measurements (pre and post feedback).

After the trials, we assessed self-reliance, other-reliance, need for cognition, and demographic questions.

ASSESSING BEHAVIORAL AUTONOMY IN RESISTANCE TO DESCRIPTIVE NORM FEEDBACK   10

Measures

For the experimental trials, we used 16 *general knowledge* items from the IST 2000R (Liepmann et al., 2012) with five multiple-choice answer possibilities ranging from a) to e), e.g., "To which country does Greenland belong?", "a) Canada"; "b) Island"; "c) Russia"; "d) USA"; "e) Denmark"; Additionally, we presented ten *spatial reasoning* items from Raven's Progressive Matrices 2 (Raven, 2019). The matrices were created to evaluate mental capacity as well as the capacity for inference. Again, each was in a multiple-choice format with answer possibilities ranging from "a)" to "e)"; we displayed all 26 items before and after the bogus feedback.

We evaluated the participants' *confidence* ("how certain are you with your answer?") on a scale from 1 = "very uncertain" to 10 = "very certain" before and after each of the general knowledge and spatial reasoning tasks.

We assessed trait autonomy using six items selected from two questionnaires. *Self-reliance (SR)* is operationalized with three items of the Trier Personality Questionnaire (Becker, 1989), and *other-reliance (OR)* with three items of the protective comparison scale (Laux & Renner, 2002), all ranging from 1 = "do not agree at all"; 5 = "completely agree". In this sample internal consistency of SR is $\Omega = .69$ and of OR is $\Omega = .64$.

Furthermore, we used the ten-item version of the Rational-Experiential Inventory, REI (Epstein et al., 1996) to assess *need for cognition* (NFC). The scale ranged from 1 = "do not agree at all" to 5 = "completely agree" and the authors report a internal consistency of $\alpha = .73$ for NFC.

Additionally, we placed two attention-check items at randomized positions (one between the NFC items and one between SR and OR items). Lastly, we collected age, gender, and the highest level of education.

Analysis Plan

Data, data analyses, preregistration of sample sizes and primary analyses, and supplemental materials are available on the Open Science Framework[4]. We used the statistical software R, version 4.1.3 (R Core Team, 2021) for all analyses.

First, we calculated the shift (total count of changing responses in the experimental trials between pre and post-feedback) separately for each task type (knowledge vs. reasoning) and type of feedback (congruent vs. incongruent). Then, for the manipulation checks, we compared the mean shift for congruent and incongruent cases using standard directed paired t-tests and the confidence before and after the feedback.

We decided to deviate from our preregistration (multiple regression) for the analyses of

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[4] Open Science Framework project: https://osf.io/tuazc/

the shift. Instead, we used a cross-classified generalized linear mixed model (GLMM) to account for the repeated measures in the experimental design. Each trial was modeled as nested in participants and in items ($ICC_{person\text{-}level}$ = .19, $ICC_{item\text{-}level}$ = .05).

We used the package *lme4* (Bates et al., 2015) and the optimizer *bobyqa* from the package *minqa* (Bates et al., 2014) to estimate the GLMMs. At the trial-level, we centered feedback correctness, initial confidence, and initial correctness with adaptive centering (Raudenbush, 2009). Following the recommendations by Yaremych and colleagues (2021), we also adaptively centered the dichotomous (initially dummy-coded) predictors to disentangle trial, person, and item effects of our trial-level predictors. We grand mean-centered SR, OR, initial correctness, initial confidence, age, and education at the person-level (i.e., the average value across all assessments and all participants) and task type at the item-level.

In the first step, we calculated the null model (model 0). Subsequently, we added all trial-related predictors and checked for the necessity of including their random slopes using model comparisons. The model including the relevant random effects was termed model 1 and extended by including first self- and other-reliance (model 2) and then the demographic variables (model 3).

As exploratory analyses, we computed the correlations between SR, OR, and NFC using Spearman's correlation coefficients. Furthermore, we examined the extreme group of non-shifters. We define non-shifters as participants who do not shift at any question in either task type. First, we performed a *MANOVA* between shifters (shifting at one or more trial) and non-shifters for SR, OR, NFC, and age. As post-hoc tests, we performed separate univariate *ANOVA*s for each of the variables.

Results

Manipulation Check: Do Participants Shift more under Incongruent Feedback?

As expected in the preregistration, count of shifts was significantly higher in incongruent compared to congruent feedback trials (Figure 2). This was true for both, the general knowledge task (M_{ic} = 3.68, SD_{ic} = 2.47 versus M_c = 0.19, SD_c = 0.60, t (391) = -27.94, p <.01, Cohen's d = 1.94) as well as the spatial reasoning task (M_{ic} = 2.35, SD_{ic} = 1.67, M_c = 0.14, SD_c = 0.46, t (391) = -25.81, p <.01, Cohen's d = 1.81). The shift at the general knowledge task (M = 3.68, SD = 2.47) and the shift in the spatial reasoning task (M = 2.34, SD = 1.67) were positively correlated r(392) = .68 (p < .01).

Figure 2

Mean Percentage of Trials with 95% CI in which responding shifted to another option after the feedback in Study
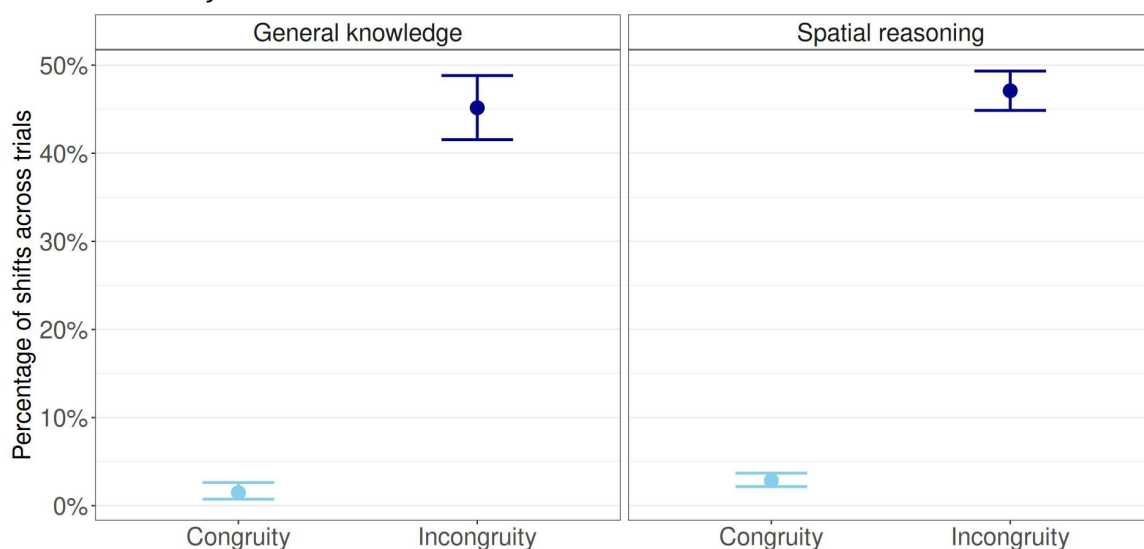
Confidence ratings for the pre feedback decision do not significantly differ between congruent and incongruent feedback trials for both task types. However, after the feedback, the confidence ratings were significantly lower in the incongruent compared to congruent feedback trials for both task types (Table 1).

Table 1

Descriptive Statistics and Mean Comparisons between Congruent and Incongruent Cases, before and after the Feedback for the General Knowledge and Spatial Reasoning Task in Study 1

		Congruent	Incongruent			
Task type	Confidence	*M* (*SD*)	*M* (*SD*)	*t*	*p*	Cohen's *d*
General knowledge	pre	4.85 (3.20)	4.89 (3.25)	-0.57	0.72	
	post	6.56 (3.01)	5.41 (3.04)	15.19	<.01	0.58
Spatial reasoning	pre	4.63 (2.99)	4.60 (2.94)	0.29	0.39	
	post	6.34 (2.99)	4.99 (2.85)	15.32	<.01	0.64

Note. n = 392, *df* = 391.

What Predicts the Shifting Probability?

For feedback correctness, we defined a random slope in the item cluster and a fixed effect of the case cluster. For initial correctness and initial feedback, all slopes are random in

item and person clusters. Results are reported in Table 2. The null model shows that there is random variation in the person and in the item cluster for all models.

Viewing all trial-related variables (model 1), we find initial correctness and initial confidence to significantly predict the probability of shifting on the lowest level. This indicates effects on the trial level when controlling for possible effects of properties of person and item, meaning that for an average person the correctness of their initial response as well as their confidence in that response leads to a lower probability of switching on that one specific trial. On the item-level only task type is a significant predictor of shift probability, whereas overall item difficulty (coded as average initial correctness for an item) and the average confidence on that item are not. Higher general initial correctness and confidence on the person-level is also associated with lower shifting probabilities, indicating that people with higher overall abilities (coded as their average initial correctness across trials) and higher habitual confidence across all trials tend to shift less often, even beyond the effects of a specific trial.

Importantly, when adding self- and other-reliance (model 2), only other-reliance plays a significant role. The higher the other-reliance, the higher the probability of shifting. Interestingly, reanalyzing the data, excluding the persons stating that they looked up questions, shows the same pattern with one remarkable difference: other-reliance is no longer a significant predictor of the shift (*OR* = 1.16, 95% *CI:* 0.97 - 1.39). For detailed reanalysis results (*N* = 285), see Supplemental Materials S1.

Adding age, gender, and education (model 3) showed no further meaningful influence on the shifting probability.

Table 2

Cross-classified Models Predicting the Shift (0 = no shift, 1 = shift) on Trial, Item and person-level for Incongruent Feedback Cases in Study 1

	Intercept only	Model 1	Model 2	Model 3
	OR [95% *CI*]	*OR* [95% *CI*]	*OR* [95% *CI*]	*OR* [95% *CI*]
Fixed part				
Intercept	0.53 [0.41-0.70]	0.40 [0.10-1.69]	0.23 [0.04-1.31]	0.29 [0.05-1.75]
Trial-level				
Feedback correctness		1.47 [0.97-2.23]	1.47 [0.96-2.23]	1.47 [0.97-2.23]
Initial correctness		0.64 [0.48-0.85]	0.64 [0.48-0.85]	0.64 [0.48-0.85]
Initial confidence		0.80 [0.76-0.84]	0.80 [0.76-0.84]	0.80 [0.76-0.84]
Item-level				
Task type		2.52 [1.55-4.12]	2.54 [1.55-4.16]	2.54 [1.54-4.17]
Feedback correctness		1.12 [0.33-3.80]	1.09 [0.32-3.70]	1.05 [0.31-3.59]
Initial correctness		3.02 [0.74-12.32]	2.99 [0.73-12.33]	2.77 [0.68-11.37]
Initial confidence		0.93 [0.76-1.13]	0.92 [0.76-1.13]	0.93 [0.76-1.13]
Person-level				
Feedback correctness		4.06 [1.17-14.08]	4.07 [1.18-14.06]	4.15 [1.20-14.32]
Initial correctness		0.05 [0.02-0.16]	0.05 [0.02-0.16]	0.07 [0.02-0.21]
Initial confidence		0.86 [0.80-0.93]	0.86 [0.80-0.93]	0.86 [0.80-0.94]
Self-reliance			0.98 [0.82-1.17]	0.97 [0.82-1.16]
Other-reliance			1.22 [1.04-1.43]	1.25 [1.07-1.47]
Age				1.00 [1.00-1.01]
Gender				0.80 [0.61-1.04]
Education				0.96 [0.90-1.03]
ICC	.35	.38	.37	.37
ICC person-level	.28	.25	.24	.24
ICC item-level	.08	.04	.05	.05
Pseudo-R$_m^2$ / pseudo-R$_c^2$	0 / .30	.17 / .44	.18 /.44	.18 /.44
Deviance	7302.59	6532.65	6526.49	6473.66
AIC	7308.59	6586.65	6584.49	6537.66
Random part				
σ^2	3.29	3.29	3.29	3.29
τ^2 person-level	1.42	1.32	1.28	1.24
τ^2 item-level	0.39	0.23	0.24	0.24

	Correlations of Random Effects (Model 1)			
	Variance	Intercept	Initial correctness	Initial confidence
τ^2 person-level initial correctness	0.24	.43		
τ^2 person-level initial confidence	0.01	-.80	-.02	
τ^2 item-level feedback correctness	0.90	.76		
τ^2 item-level initial correctness	0.21	.22	-.03	

$\tau^2_{item\text{-}level}$ initial confidence	0.01	-.65	-.60	.22

Note. N_{person} = 392, $N_{item\text{-}level}$ = 26; *pseudo-*ΔR_m^2 = marginal *pseudo-*R^2 (fixed effects)*;* *pseudo-*ΔR_c^2 = conditional pseudo-R^2 (random and fixed effects); variances and correlations of random effects are reported for model 1; the regression coefficients and exact values for model 2 and 3 are listed in the analysis scripts.

Exploratory Analysis: Need for Cognition

Next, we found SR to be mildly positively correlated with NFC. Also, there is a slight negative association between OR and NFC (Table 3).

Table 3

Descriptive Statistics and Bivariate Correlations r_S *(p) in Study 1*

	M	SD	1	2
1 Self-Reliance	4.00	0.75		
2 Other-Reliance	3.21	0.81	-.19 (<.01)	
3 Need for Cognition	3.49	0.80	.20 (<.01)	-.12 (.04)

Note. n = 392. For these tests, *p*-values are adjusted for multiple testing with Holm (1979) method.

Exploratory Analysis: Extreme Group of Non-Shifters

For the general knowledge task, *n* = 48 persons did not shift, and for the spatial reasoning task, *n* = 68 did not. Only *n* = 26 persons did not shift at either task type. Using Pillai's trace, there was no significant differentiation between non-shifters and shifters by SR, OR, NFC, or age for the general knowledge task, V = 0.02, F (4, 390) = 1.89, p = .13, and for the spatial reasoning task, V = 0.02, F (4, 390) = 1.61, p = .17.

Study 2

In this second study, we replicated the paradigm in our laboratory to control for confounding factors. We especially wanted to investigate whether the possibility of looking up the general knowledge items online while responding to the questionnaire had influenced our results and whether the found effects are stable under controlled conditions. Hence we conducted the same experimental task paradigm but under supervision and without access to mobile phones or the internet. Moreover, instead of assessing need for cognition, we focused on personality traits that we expected to be related to self-and other-reliance. Hence, we added the questionnaires for autonomy-connectedness, autonomous functioning, and the Big Five.

Method

Participants

We conducted Study 2 from May 30th until June 30th, 2022, in our laboratory. Due to time and economic restrictions, we preregistered to stop data collection at *N* = 200 participants

or on June 30th, 2022, whichever occurred first. We stopped data collection on June 30th, 2022, when we had n = 110 fully completed questionnaires. As preregistered, we included only participants who responded correctly to the two control items, yielding n = 93 participants (62 female, 30 male, one non-binary) in the final sample. Participants' age (M = 27.84, SD = 11.23) ranged from 19 to 64 years. They reported having a secondary school leaving certificate (2%), A-levels (70%), other school leaving degree (1%), or university/college degree (27%) as the highest achieved educational degree.

Procedure

Lab sessions took 37.92 minutes on average. Again, the experiment was set up with SoSci Survey (Leiner, 2019). First, participants gave written informed consent. Then in randomized order, the participants responded first to the trait questionnaires, followed by the experimental trials, or vice versa. We used the following trait questionnaires: our six-item scale to measure self-reliance and other-reliance, autonomy-connectedness (Bekker & van Assen, 2006), index autonomy functioning (Weinstein et al., 2012), and the big five using the German NEO - FFI questionnaire (Borkenau & Ostendorf, 2008). In the end, all participants answered demographic questions.

Experimental Task Design. We used the same paradigm as described in Study 1.

Measures

Again, we used the self-report measures *self-reliance* and *other-reliance*, the 16 *general knowledge* items and ten *spatial reasoning* items and confidence ratings as in Study 1.

Furthermore, we assessed the *index of autonomous functioning* (IAF) to measure dispositional autonomy (Weinstein et al., 2012), consisting of the three sub-scales: susceptibility to control, interest taking, and authorship/self-congruence, with five items each. Items are measured on a Likert-scale from 1 = "not at all true" to 5 = "completely true".

Next, we measured *autonomy-connectedness* (ACS) on three sub-scales: sensitivity to others (SO), capacity to manage new situations (CMNS), and self-awareness (SA) (Bekker & van Assen, 2006). The ACS-30 comprises 30 items in total (SO: 17 items, CMNS: 6 items, SA: 7 items), measured on a 5-point Likert scale (1 = "disagree" to 5 = "agree"). Due to a coding error, we assessed ACS-30 only for n = 53 participants.

Last, we assess the *Big Five* personality traits using the NEO-Five Factor Inventory (NEO-FFI; McCrae & Costa, 2004; German version: Borkenau & Ostendorf, 2008). The items on the five sub-scales, agreeableness, extraversion, conscientiousness, neuroticism, and openness, were rated on a scale ranging from 1 = "do not agree at all" to 5 = "completely agree." Additionally, we collected age, gender, and the highest level of education.

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Analysis Plan

We used the statistical software R, version 4.1.3 (R Core Team, 2021) for all analyses and proceeded as described in the following. The data, data analyses, preregistration of sample sizes and primary analyses, and supplemental materials are available on the Open Science Framework[5].

We define the shift as the total score of shifts between pre and post-feedback for each task type, analogous to Study 1. For the manipulation checks, we compared the mean shift for congruent and incongruent cases using standard directed paired t-tests and the confidence before and after the feedback.

Again, we deviated from our preregistration for the shift analyses and performed cross-classified generalized linear mixed models. Using this multilevel approach allows us to account for the repeated measures of pre and post each bogus feedback nested within participants ($ICC_{person-level}$ = .10) and in items ($ICC_{item-level}$ = .03). We also performed the models with the package *lme4* (Bates et al., 2015), maximum likelihood estimation, and the optimizer *bobyqa* from the package *minqa* (Bates et al., 2014). Analogous to Study 1, we used adaptive centering (Raudenbush, 2009) at the trial-level for feedback correctness, initial confidence, and initial correctness and grand mean-centered SR, OR, NFC, initial correctness, initial confidence, age, and education at the person-level (i.e., the average value across all assessments and all participants). The modeling approach was analogous to the approach used for Study 1: We checked for each trial-level predictor whether we should consider the effect as random or fixed using model comparisons. To this model we then added task-type as an item-level predictor (model 1). In the subsequent steps we then added SR and OR as predictors on the person-level (model 2) before adding demographic variables (model 3).

Next, we investigated the relations between SR and OR with the autonomy-connectedness scale (ACS-30, Bekker & van Assen, 2006) and index autonomy functioning scale (IAF, Weinstein et al., 2012). As preregistered and because not all sub-scales were normally distributed, we used the Spearman's r_s correlation coefficient. For the statistical tests, p-values are adjusted for multiple testing with Holm's (1979) method p_H.

Finally, we look at the extreme group of non-shifters. We define non-shifters as participants who do not shift at any question in either task type. Due to the small number of non-shifters at the general knowledge task, we only report these descriptively. For the spatial reasoning task, we performed one-sided t-tests between shifters and non-shifters for self-reliance, other-reliance, authorship, susceptibility to control, dispositional autonomy, and self-

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[5] Open Science Framework project: https://osf.io/tuazc/

awareness, as preregistered. As an exploratory analysis, we conducted a *MANOVA* between shifters and non-shifters for sensitivity orientation, capacity for managing, and the Big FIVE (agreeableness, conscientiousness, extraversion, neuroticism, and openness to experience).

Results

Manipulation Check: Do Participants Shift more when Seeing Incongruent Feedback?

Again, we begin by reporting the results of the manipulation check (Figure 3). As preregistered, participants shifted in significantly more often in trials with incongruent feedback than with congruent feedback for both, the general knowledge task (M_{ic} = 3.61, SD_{ic} = 2.17, M_c = 0.12, SD_c = 0.44, t (92) = -15.11, p <.01, Cohen's d = 2.24) as well as the spatial reasoning task (M_{ic} = 1.24, SD_{ic} = 1.24, M_c = 0.13, SD_c = 0.40, t (92) = -8.08, p <.01, Cohen's d = 1.21). The shift at the general knowledge task (M = 3.61, SD = 2.17) and the shift in the spatial reasoning task (M = 1.24, SD = 1.24) were positively correlated r(93) = .35 (p < .01).

Figure 3

Mean Percentage of Trials with 95% CI in which responding shifted to another option after the feedback in Study 2
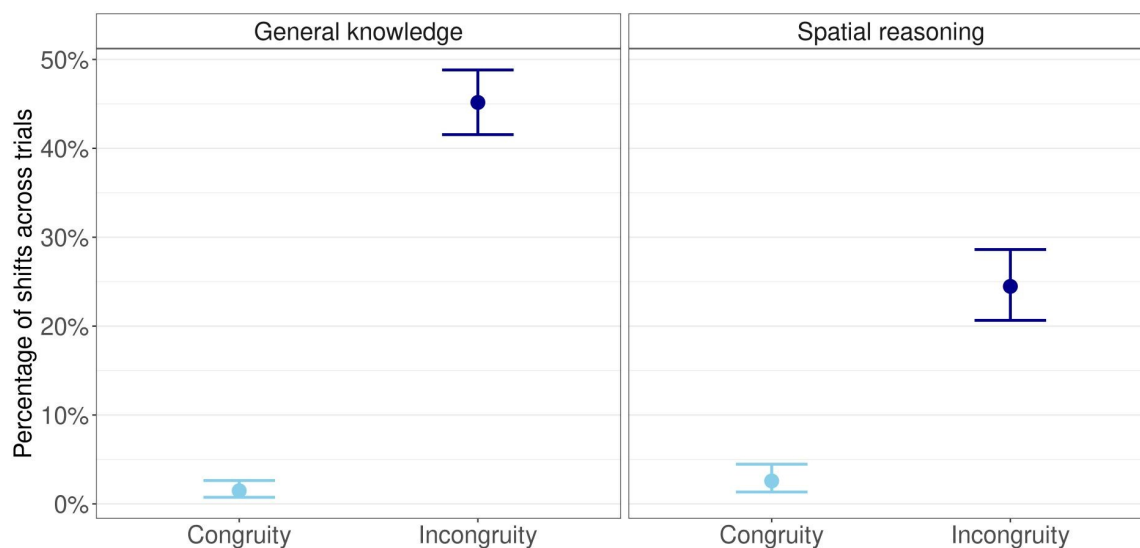
As expected, the initial confidence ratings do not significantly differ, but after the feedback, the confidence is significantly lower in the incongruent cases for both task types (Table 4).

Table 4

Descriptive statistics and mean comparisons between congruent and incongruent cases and pre and post feedback for both task types in Study

		Congruent	Incongruent			
		M (*SD*)	*M* (*SD*)	*t*	*p*	Cohen's *d*
Task Type	Confidence					
General Knowledge	pre	4.67 (3.17)	4.49 (3.09)	1.31	0.10	
	post	6.32 (3.00)	4.69 (2.91)	11.23	<.01	0.95
Spatial Reasoning	pre	5.52 (3.27)	5.67 (3.23)	-0.79	0.78	
	post	6.80 (3.16)	5.39 (3.17)	6.46	<.01	0.73

Note. *n* = 93, *df* = 92.

What Predicts the Probability of Shifting?

We used fixed effects for all trial-level predictors, feedback correctness, initial correctness, and initial confidence on the person cluster. For the item cluster, feedback correctness and initial correctness have random slopes. We restricted the correlations between the random effect due to the singularity of the model. Again, we report the results of the GLMMs in Table 5. The null model shows a random variation in the person and the item cluster.

As found in Study 1, on the trial-level, initial correctness and initial confidence significantly decrease the probability of shifting. On the item-level, none of the predictors are statistically meaningful. On the person-level, we again find the large effect of initial correctness, meaning that participants who are more often correct across trials tend to have a lower probability of shifting, even when controlling for their correctness on a specific trial. In contrast to Study 1, the average level of confidence of participants was not a significant predictor of shift probability.

By adding SR and OR to model 2, we found that OR increases the probability of shifting. In accordance with Study 1, self-reliance showed no meaningful effect.

As an exploratory step, in model 3, we added age, gender, and education. We found a small effect of age. With higher age, the probability of shifting decreased slightly.

Table 5

Cross-classified Models Predicting the Shift (0 = no shift, 1 = shift) on Trial, Item and person-level for Incongruent Feedback Cases in Study 2

	Intercept only	Model 1	Model 2	Model 3
	OR [95% *CI*]	*OR* [95% *CI*]	*OR* [95% *CI*]	*OR* [95% *CI*]
Fixed part				
Intercept	0.37 [0.28-0.49]	2.13 [0.25-18.44]	.86 [0.06-12.40]	13.3 [0.49-353.58]
Trial-level				
Feedback correctness		1.62 [0.94-2.77]	1.61 [0.95-2.74]	1.64 [0.96-2.80]
Initial correctness		0.64 [0.42-0.97]	0.63 [0.41-0.96]	0.62 [0.40-0.95]
Initial confidence		0.80 [0.76-0.85]	0.80 [0.76-0.85]	0.80 [0.76-0.85]
Item-level				
Task type		0.71 [0.43-1.16]	0.71 [0.43-1.16]	0.72 [0.43-1.19]
Feedback correctness		1.51 [0.31-7.46]	1.49 [0.30-7.31]	1.45 [0.28-7.54]
Initial correctness		4.06 [0.95-17.37]	4.17 [0.98-17.80]	4.17 [0.93-18.69]
Initial confidence		0.95 [0.71-1.28]	0.95 [0.71-1.28]	0.95 [0.70-1.30]
Person-level				
Feedback correctness		0.55 [0.07-4.20]	0.55 [0.08-3.96]	0.67 [0.10-4.34]
Initial correctness		0.06 [0.01-0.39]	0.05 [0.01-0.35]	0.04 [0.01-0.24]
Initial confidence		0.90 [0.76-1.07]	0.87 [0.73-1.04]	0.94 [0.79-1.12]
Self-Reliance			0.92 [0.70-1.22]	0.89 [0.68-1.16]
Other-Reliance			1.49 [1.11-1.99]	1.42 [1.07-1.88]
Age				0.97 [0.95-0.98]
Gender				0.76 [0.49-1.18]
Education				0.82 [0.63-1.06]
ICC	.21	.19	.18	.16
ICC person-level	.15	.16	.14	.12
ICC item-level	.05	.03	.03	.04
Pseudo-R$_m^2$ / pseudo-R$_c^2$	0 / .15	.14 / .30	.15 / .30	.18 / .31
Deviance	1749.15	1561.95	1561.25	1535.03
AIC	1755.15	1597.95	1595.25	1575.03
Random part				
σ^2	3.29	3.29	3.29	
τ^2 item-level	0.64	0.65	0.58	
τ^2 person-level	0.23	0.14	0.14	
		Variance (model 1)		
τ^2 item-level feedback correctness		1.04		
τ^2 item-level initial correctness		0.22		

Note. N_{person} = 93, N_{item} = 26; ΔR_m^2 = marginal *pseudo-R^2* (fixed effects)*;* ΔR_c^2 = conditional *pseudo-R^2* (random and fixed effects); Correlations between random effects were set to 0. variances effects are reported for model 1; the coefficients and exact values for model 2 and 3 are listed in the analysis scripts.

Investigation on the Construct Validity of Self-Reliance and Other-Reliance

As predicted, we found SR to be significantly positively correlated with the IAF sub-scale authorship/self-congruence and the ACS sub-scale self-awareness, and to be negatively correlated with the ACS sub-scale sensitivity to others. As predicted, OR is significantly negatively correlated with index autonomy functioning, namely dispositional autonomy, and positively correlated with the sub-scale susceptibility to control. All further associations were not meaningful (Table 6).

Table 6

Descriptive Statistics, and Level-Specific Bivariate Correlations r_s (p)

	M	SD	n	1	2
1 Self-Reliance	3.87	0.77	94		
2 Other-Reliance	3.60	0.74	94	-.09 (.39)	
3 Authorship/Self-Congruence	3.87	0.54	94	.32 (.01)	-.18 (.23)
4 Susceptibility to Control	2.74	0.78	94	-.16 (.25)	.40 (<.01)
5 Dispositional Autonomy	3.33	0.42	94	.23 (.13)	-.30 (.02)
6 Self-Awareness	3.18	0.48	53	.43 (.01)	-.30 (.16)
7 Sensitivity to Others	2.75	0.83	53	-.39 (.03)	.25 (.30)
8 Capacity for Managing New Situations	3.05	0.70	53	.31 (.14)	-.21 (.42)

Note. n varies for ACS Scale. *p*-values are adjusted for multiple testing with Holm (1979) method.

Extreme Group: Non-Shifters

In the general knowledge task *n* = 8 persons did not shift at all and for the spatial reasoning task *n* = 30 did not shift at all. In combination, only *n* = 5 persons did not shift at any task type. Due to the small number of non-shifters at the general knowledge items, we only display the descriptive values. For the spatial reasoning task, as preregistered, we found the non-shifters to score significantly higher in self-reliance and self-awareness than the shifters (Table 7). We also found the non-shifters to show significantly lower values in OR and susceptibility to control than the shifters. For authorship and dispositional autonomy, we could not find the expected effects. The exploratory *MANOVA* between non-shifters and shifters for sensitivity orientation, capacity for managing and the Big FIVE (agreeableness, conscientiousness, extraversion, neuroticism, and openness to experience) revealed no meaningful differences.

Table 7

Descriptive Statistics and Mean Comparisons of Self- and Other-Reliance, Authorship, Susceptibility to Control, Dispositional Autonomy, and Self-awareness for Non-Shifters versus Shifters at General Knowledge and Spatial Reasoning Task

	General Knowledge		Spatial Reasoning				
	Non-Shifters	Shifters	Non-Shifters	Shifters			
	$n = 8$	$n = 85$	$n = 30$	$n = 63$			
	M (SD)	M (SD)	M (SD)	M (SD)	t (df)	p	Cohen's d
Self-Reliance	3.96 (0.58)	3.84 (0.78)	4.04 (0.67)	3.76 (0.80)	1.79 (66.8)	0.04	0.37
Other-Reliance	3.25 (0.96)	3.63 (0.72)	3.30 (0.82)	3.74 (0.67)	-2.54 (48.2)	0.01	0.61
Authorship/Self-Congruence	3.60 (1.03)	3.90 (0.46)	3.93 (0.64)	3.85 (0.47)	0.65 (44.68)	0.26	
Susceptibility to Control	2.45 (0.97)	2.76 (0.76)	2.49 (0.75)	2.84 (0.77)	-2.01 (59.0)	0.02	0.46
Dispositional Autonomy	3.38 (0.46)	3.33 (0.42)	3.41 (0.43)	3.30 (0.41	1.21 (54.67)	0.12	
Self-Awareness	3.21 (0.83)	3.03 (0.69)	3.28 (0.69)	2.95 (0.69)	1.61 (28.69)	0.06	0.48

Note. n = 93, df = 92.

Exploratory Analysis

Finally, there were no significant inter-correlations between self-reliance and other-reliance with the Big Five personality traits.

General Discussion

To elucidate trait characteristics behind reactively autonomous behavior, we investigated what kinds of individuals tend to resist the influence of inconsistent feedback on descriptive norms in their decision-making about factual questions. In two studies, one online and one in the laboratory, participants responded to 26 trials before and after bogus feedback presentation of the descriptive norm. In this experimental setting, not-shifting the initial answer after seeing inconsistent feedback is taken as a behavioral measure of reactive autonomous behavior.

In terms of the shifting probability, we find, as expected, that participants in both studies shifted significantly more often when getting feedback incongruent with their initial answer than congruent feedback. In congruent trials, overall, few participants shifted (< 3% of all trials). However, we find small differences between the study settings and the types of questions asked in the incongruent trials. In the general knowledge trials, the shifting probability was similar

across both studies (Study 1: 46% and Study 2: 45%). However, this was different in the spatial reasoning trials: In Study 1, participants shifted in 47% of trials, while in Study 2, participants shifted in only 24% of the trials. Hence, in the laboratory study, fewer persons shifted in the spatial reasoning task compared to the online study. The online sample was more representative of the average German population, whereas the laboratory sample was above average, well-educated, and young. According to Nickerson and colleagues (2013) and Raven (2000), more open and progressive education fosters the educative ability which is needed to solve the matrices, and others also find age differences in cognitive performance (Salthouse, 2003). The difference in shifting in the laboratory sample compared to the online sample could thus be due to the younger sample age and, therefore, higher educative ability to solve the spatial reasoning tasks.

In the online and the laboratory study, participants reported being significantly less confident about their decision after seeing the incongruent feedback in both task-types. Also, across both task-types and studies, participants shifted significantly more often in incongruent feedback trials than in congruent feedback trials.

In both studies, the initial correctness and the initial confidence on trial-level significantly decreased the probability of shifting. Paradigms of previous studies (Laporte et al., 2010; Wijenayake et al., 2020) also found participants' initial confidence indicative of the change. Furthermore, the initial correctness was associated with a largely decreased probability of shifting on the person-level, indicating that people who tend be correct more often in general, are also less likely to shift when given external feedback (irrespective of whether they were correct on that specific trial). Additionally, Study 1 showed that confidence in one's response is not only related to shift-probability in a specific situation (i.e. within a single trial) but also in general. This indicates that trait effects may lead to decreased susceptibility to external feedback in individuals who often believe they are right. However, this finding was not replicated in Study 2 and thus requires additional investigation. The inconsistent result found in Study 2 could be due to the relatively small sample size in this sample (N = 92). Further on-site studies with bigger sample sizes are needed to clarify the pattern. In Study 1, the correctness of the feedback was significantly associated with an increased probability of shifting, in contrast to Study 2, where this effect was not meaningful. Conversely, task type on the item-level predicts the shifting probability in Study 1 but not in Study 2.

Next, we looked into the trait characteristics underlying the reactively autonomous behavior in our experimental setting and the probability of shifting. We expected self-reliance to predict reactive autonomy positively. Thus we presumed an inverse relationship between self-

reliance with response shifting. However, we did not find any meaningful association in cross-classified models predicting the probability of shifting. Nevertheless, we found other-reliance to significantly increase the likelihood of shifting across both studies. Hence, the higher the other-reliance, the lower the reactive behavioral autonomy. In other words, the more individuals self-report the tendency to rely on others in their decision-making, the more they proved susceptible to the influence of the descriptive norm in our experimental setting.

Interestingly, when we excluded the persons who admitted to having looked up at least one of the questions (Supplemental Materials S1), the pattern of the results changed for one variable: Self-reported other-reliance was no longer meaningful for shifting. The association might be mainly driven by those who do indeed rely on others by searching for solutions online.

Then, we inspected the extreme group of the non-shifters, the reactively autonomous persons according to our interpretation. In Study 1, we could not find meaningful differences between shifters and non-shifters regarding self- and other-reliance and need for cognition. Due to the small sample size in Study 2, we only analyzed the data of the non-shifters for the spatial reasoning task. However, the non-shifters showed significantly higher scores on self-reliance and self-awareness. Furthermore, the mean ratings of other-reliance and susceptibility to control are significantly lower for the non-shifters.

Interestingly, across both studies, we find different results for the task types. Even though the probabilities of shifting on the two task types are correlated, it is not automatically the same person not-shifting at both task types. In Study 1, the shift between the two task-types is moderately correlated. In Study 2, though, the relationship is somewhat less intense. We did not expect such differences since we picked factual questions with comparable difficulty and uncertainty ratings. This could indicate that the two task types are at least partially based on different processes. Whereas spatial reasoning needs more visual and mathematical thinking, the general-knowledge questions are based on educational factors and also memory capacity. Nonetheless, we found that the non-shifters score higher on the autonomy-related concepts of self-reliance and self-awareness. Therefore, these constructs should be considered for future attempts at autonomy operationalization. One means by which self-awareness can be increased is by mirror observation (Diener & Wallbom, 1976; Kernis & Goldman, 2006; Kernis & Grannemann, 1988), and self-reliance could perhaps be strengthened trough instructions asking for speeded responding, so that participants are prevented from retrieving other-related information (such as norms) from memory during decision-making (Kahneman & Miller, 1986). The negative factors of autonomy, other-reliance, and susceptibility to control, could also be applied in future conceptualizations.

Finally, we also investigated how self- and other-reliance are related to other traits. Since being autonomous requires the ability and willingness to think for oneself, we expected a positive connection with NFC. In Study 1, we did indeed find a small positive association of NFC with self-reliance and a slightly negative association with other-reliance. In Study 2, we focused on relating self- and other-reliance to other personality traits, as preregistered. In accord with our expectations, we found SR to be significantly positively correlated with authorship/self-congruence and self-awareness, and negatively correlated with sensitivity to others. Moreover, as expected, other-reliance was negatively correlated with the index autonomy functioning scale, referred to as dispositional autonomy, and, also as expected, positively with the susceptibility to control subscale, thus supporting the assumption that self-and other-reliance could be relevant autonomy factors. This pattern provides a more fine-grained image of what components are relevant to self- and other-related orientation in decision-making, besides characterizing individuals who are high in trait autonomy as rational, not susceptible for control and highly sensitive to their own role relative to that of others. On the other hand, in our exploratory analysis, we did not find any associations between the Big Five and self-and other-reliance, unlike, for example, Koestner and Losier (1996), who did find links between the Big Five to reactive and reflective autonomy. Likewise, Hmel & Pincus (2002) found autonomy as self-governance to be significantly positively correlated with agreeableness, conscientiousness, while openness correlated negatively with neuroticism.

Limitations, Future Directions for Theoretical and Practical Implications

One major limitation of the study is the assessment of self- and other-reliance with a short and hitherto untested questionnaire. Even though our preliminary evidence suggests that the two factors are indeed components of autonomy, we have come to believe that autonomy may have more characteristics than those two facets. In a prior study (Zey & Windmann, 2022), we found that laypersons define autonomy not only in terms of independence of others and self-awareness, as may reflect other- and self-relatedness, but also in terms of dignity and morality, in correspondence with scientific criteria. These two facets require reconsideration in a more exhaustive psychometric assessment of autonomy.

From a theoretical perspective, self-knowledge and need for cognition should be considered essential requirements for autonomy, as these are the basis of strategic decision-making in line with one's own goals and values. Moreover, as proposed in Self-Determination Theory, motivational processes underlying dispositional autonomy should be considered (Ryan et al., 2021b; Weinstein et al., 2012). Furthermore, we need to account for the prosocial nature of humans, and autonomy should be viewed in the sense of interdependence from others rather

than independence from others. The work of Beyers and colleagues (2003) on autonomy as an umbrella term across the factors of connectedness, separation, detachment, and agency, and the work of Bachrach and colleagues (2013) and Bekker and van Assen (2006) on the equality concept autonomy-connectedness, lead to a more comprehensive view of autonomy. On the same notion, Fousiani and colleagues (2014) state that autonomy, defined as self-endorsement and volitional functioning, is a universally crucial dynamic that is not specific to boys, cultures that value individualism, or older adolescents.

From a methodological standpoint, the reliability of the SR and OR short scales is insufficient. in fact, the limited reliability might partly explain why SR is not a significant negative predictor for the shifting probability. Clearly, there is a need for a better measure of the components underlying autonomy and their contributions to reactive and reflective forms. On the one hand, we need experimental paradigms to measure these two constructs reliably and validly in behavior. On the other hand, we need self-report scales to assess autonomy quickly and from first-person perspectives.

Furthermore, related concepts such as emotional-reliance (Erving & Thomas, 2018; Lynch, 2013) should be delineated, and the resulting links should be examined. For example, Ryan and colleagues (2005) discuss that autonomy differs from independence (self-reliance) by the willingness status. An individual can willingly or autonomously rely on others; on the contrary, it is also possible that an individual is pressured or controlled into relying on or depending on others. This complexity should be reflected in future research so that autonomy can be promoted as a state in which one's behavior reflects who one is (Weinrib, 2019).

To our knowledge, our studies are the first to connect behavioral autonomy shown in an experimental setting to autonomy as a personality trait. We used an online study and a study in our laboratory. For future confirmation and extension of the present findings, it would be helpful to investigate the effects of face-to-face group discussions on shifts in decision-making. We would expect these to depend on and interact with different motivational backgrounds, e.g., social value orientation. We infer this from studies that found conformity behavior often appears when we try to fit in or want to be liked or right (Deutsch & Gerard, 1955).

Another limitation of the current work is the age and education differences between the two samples. While sample 1 represents the German population regarding age, gender, and education, sample 2 primarily consists of (psychology) students, friends, and the researchers' families. In addition, most participants (96.77%) in Study 2 have a college/university degree or A-level, which is not representative of the population. Nonetheless, most effects are similar: the proportion of shifts in congruent and incongruent cases are very similar. Also, the link between

OR and the probability of shifting was replicated in Study 2.

Moreover, we must address that the sample is drawn from the German population only and adds to the bias of Western, educated, industrialized, rich, and democratic (WEIRD) samples (Henrich et al., 2010). Since most of the literature defines autonomy from an individualistic perspective, there is a need for further investigation between different cultures (e.g., collectivist or small-scale societies). A large-scale data set investigation by Li and colleagues (2022) found a moderating role of individualism-collectivism on the link between autonomy and life satisfaction. Even though personal autonomy was consistently associated with higher levels of subjective well-being, the association was weaker in collectivistic cultures than individualistic cultures.

Additionally, according to Bekker and van Assen (2006), persons with high scores on autonomy-connectedness are psychologically well-adjusted, have a decreased risk for psychopathology, and are in balance between dependency and independence. Furthermore, as autonomy plays a considerable role in life satisfaction and well-being, it is essential for intrinsic motivation and experiences of self-congruence. In this sense, promoting autonomy could boost self-knowledge and personality growth. Therefore, any way to foster individual autonomy is of relevance for a good life for everyone since autonomy, well-being, and life satisfaction show a prominent link. Fousiani and colleagues distinguish autonomy as self-endorsement and autonomy as independence. Accordingly, one way to foster individual autonomy during adolescence is through parenting strategies encouraging volitional functioning rather than self-reliance as such (Fousiani et al., 2014). Thus, adolescents are more likely to act autonomously if their parents allow their children to experience a sense of psychological freedom and personal relevance and receive support in critical situations.

Societies can benefit from the encouragement of individual autonomy. Critical thinking and the ability for autonomy are essential to democracies and to defend human rights despite misinformation or populism. A better understanding of autonomy and its underlying processes could help disarm misinformation and populism and thereby defend human rights and equality.

In conclusion, we have introduced a new paradigm for the experimental study of reactive autonomy that needs further exploration and establishment. Self- and other-reliance represent promising starting points in providing initial clues as to the personality traits characterizing autonomous individuals.

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Contributions

SW and EZ: Conceptualization; EZ: Data curation; MS, SW, and EZ: Formal analysis; EZ: Investigation; MS, SW, and EZ: Methodology; SW and EZ: Project administration; MS and SW: Supervision; EZ: Visualization, EZ and SW: Writing – original draft, MS and SW: Writing – review & editing

Competing interests

The 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.

Supplemental material

The Supplementary Material for this article can be found online at the Open Science Framework: https://osf.io/tuazc/

Data accessibility statement

Data, data analyses, preregistrations of sample sizes and primary analyses, and supplemental materials are available on the Open Science Framework (https://osf.io/tuazc/).

Figure titles and legends

(in text, Figures also as separate file)

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Appendix

Appendix
Self-Report: Autonomy Trait Items

Table A1

Autonomy Trait Items as presented in Article 2 - Part 1

	English translation	German Original
	Trier Personality Questionnaire by Becker (1989)	
1	I find it hard to make decisions on my own.	Es fällt mir schwer, Entscheidungen selbstständig zu treffen.
2	When I have a difficult problem to solve, I ask someone to help me.	Wenn ich ein schwieriges Problem zu lösen habe, bitte ich jemanden, mir behilflich zu sein.
3	I lean on stronger people.	Ich lehne mich an stärkere Menschen an.
4	I like to make important decisions on my own. (SR)	Wichtige Entscheidungen treffe ich gerne allein.
5	I want to take responsibility for my life alone. (SR)	Die Verantwortung für mein Leben möchte ich allein übernehmen.
6	I like to go my own ways. (SR)	Ich gehe gerne meine eigenen Wege.
	Protective Social Comparison Scale by Laux and Renner (2002)	
7	It is my feeling that if everyone else in a group is behaving in a certain manner, this must be the proper way to behave.	Wenn sich alle Personen in einer Gruppe auf eine bestimmte Art und Weise verhalten, dann habe ich das Gefühl, dass das die richtige Art sein muss sich zu verhalten.
8	When I am uncertain how to act in a social situation, I look to the behavior of others for cues. (OR)	Wenn ich nicht weiß, wie ich mich in einer bestimmten Situation verhalten soll, orientiere ich mich am Verhalten anderer.
9	I try to pay attention to the reactions of others to my behavior in order to avoid being out of place. (OR)	Ich versuche, die Reaktionen anderer auf mein Verhalten zu registrieren, damit ich mich nicht selbst ins Abseits stelle.
10	The slightest look of disapproval in the eyes of a person with whom I am interacting is enough to make me change my approach.	Der geringe Hinweis von Missbilligung in den Augen einer anderen Person genügt, damit ich mein Verhalten ändere.
11	It is important to me to fit in to the group I am with. (OR)	Es ist wichtig für mich, mich in die Gruppe, in der ich mich gerade aufhalte, einzupassen.
12	My behavior often depends on how I feel with others wish me to behave.	Mein Verhalten ist oft so, wie andere es sich wünschen.

Note. Items were measured on a Likert-type scale ranging from 1, "do not agree at all," to 5, "completely agree." Items 1, 2, 3, 7, 8, 9, 10, 11, and 12 are reverse scored.

SR: item of self-reliance sub-scale, OR: item of other-reliance sub-scale.

Table A2

Autonomy Trait Items as presented in Article 2 - Part 2

	English translation	German Original
	Moral Agency Scale by Black (2016)	
13	If I get into trouble, it is my own fault even if someone else told me to do it.	Wenn ich in Schwierigkeiten gerate, ist das mein eigenes Verschulden, auch wenn mir eine andere Person die Anweisung dafür gegeben hat.
14	I make up my own mind about doing good or bad things.	Ich entscheide selbst darüber, gute oder schlechte Dinge zu tun.
15	I am just as at fault for breaking the rules when no one knows as when everyone knows.	Es ist genauso mein Verschulden, die Regeln zu brechen, auch wenn es niemand mitbekommt, wie wenn alle mein Verhalten mitbekommen.
16	I am the one responsible for my own behavior, good and bad.	Ich bin für mein Verhalten, sowohl gutes als auch schlechtes, selbst verantwortlich.
17	I feel responsible for the consequences of my actions.	Ich fühle mich verantwortlich für die Folgen meiner Handlungen.
18	Most of the time I can tell how my actions are going to affect others.	Die meiste Zeit kann ich sagen, wie meine Handlungen andere beeinflussen werden.
19	In most cases, I can make my own decisions about what is right or wrong in a situation.	In den meisten Fällen kann ich meine eigenen Entscheidungen in Situationen darüber fällen, was richtig oder falsch ist.
20	If I feel pressured into doing something, I am not as responsible as when I decide on my own.	Wenn ich mich zu einer Tat gedrängt fühle, bin ich nicht so verantwortlich, wie wenn ich selbst entscheide.
21	No one can make me do something I know to be wrong.	Niemand kann machen, dass ich etwas tue, von dem ich weiß, dass es falsch ist.
22	My actions in most situations are based on what other people tell me is the right thing to do.	In den meisten Situationen basieren meine Handlungen darauf, was andere Menschen mir sagen, was das Richtige zu tun ist.

Note. Items were measured on a Likert-type scale ranging from 1, "do not agree at all," to 5, "completely agree." Items 20 and 22 are reverse scored.