Postoperative kinesiophobia in patients with acute type A aortic dissection: A cross-sectional study

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Abstract

Objective: There have been no studies on postoperative kinesiophobia in patients with acute type A aortic dissection (AAAD). In this study, we conducted a cross-sectional investigation on the occurrence of postoperative kinesiophobia in patients with AAAD, and discussed the influence of related variables on kinesiophobia.

Methods: A total of 312 patients diagnosed with AAAD treated with surgery at Our Center from January 2019 to December 2021 were enrolled. The level of kinesiophobia was assessed using the Cardiac Motor fear Scale (TSK-SV-HEART), and patients with kinesiophobia were classified as patients with TSK > 37. Univariate analysis and multivariate logistic regression analysis were used to determine the influence of related factors on kinesiophobia in AAAD patients.

Results:A total of 264 patients were included in this study, and the mean score of postoperative kinesiophobia was 38.15±6.66, with an incidence of 46.2%. Multivariate logistic regression analysis showed that the following variables could reduce the occurrence of kinesiophobia: Education level (OR=11.34, 95%CI: 3.62-35.54), general self-efficacy (OR=0.73, 95%CI: 0.61–0.87), family care index (OR=0.26, 95%CI: 0.15–0.46), facing style (OR=0.66, 95%CI: 0.54–0.81); Two variables increased the level of kinesiophobia: avoidance style (OR=1.73, 95%CI: 1.40–2.15) and yielding style (OR=2.04, 95%CI: 1.56–2.66) were risk factors for kinesiophobia in patients with acute type A aortic dissection (P < .001).

Conclusion: The incidence of postoperative kinesiophobia in patients with AAAD is high, and it is related to various factors. Medical staff must be attentive to the potential occurrence of kinesiophobia during postoperative rehabilitation.

1. Introduction

Acute type A aortic dissection (AAAD) is a dangerous condition that usually presents with sudden and severe chest, back and abdominal pain wherein the typical initial symptoms are such that patients feel tearing or impending doom, and undergo shock in severe cases; the detection rate and number of cases have been increasing annually [1]. Advances in medical technology have improved the survival rate of patients with AAAD, and the 1-year survival rate was 94%, and the 2-year survival rate was 92.2% [2]. A database from the International Registry of Acute Aortic dissection (IRAD) [3] revealed that 54.9% of patients with Type A dissection lacked physical activity after surgery, and the number showed a gradually increasing trend. Patients with AAAD are still at high risk of postoperative aortic lesions and related cardiovascular events, and their quality of life is lower than that of the normal population [4]. Studies have shown that over 50% of patients with AAD experience new depression due to lack of physical activity, and more than one-third of patients have reported disability at work [4]. Studies have demonstrated that exercise is a key factor in cardiac rehabilitation (CR), and CR reduces cardiac mortality and risk of hospitalization [5], and improves oxygen uptake and mental health [6,7]. A study on kinesiophobia in hospitalized patients with acute cardiovascular events also reported that 83% of

patients had kinesiophobia [8], which reduced the CR attendance rate [9]. The European Society of Cardiology emphasizes that exercise at a safe level is feasible for patients with heart disease [10]. However, Pasadyn et al. [11] investigated 132 postoperative patients with AAAD and found that 36% did not participate in CR treatment, exhibiting low participation and compliance. Studies have shown that high levels of kinesiophobia are associated with a decline in health-related quality of life, muscle strength and physical activity levels [12].

Kinesiophobia was first put forward by Kori et al. [13] and refers to "an excessive, unreasonable, and debilitating fear of movement and activity derived from vulnerability to painful injury or re-injury". In the early stage after acute cardiovascular events, fear and related avoidance behaviors are typical psychological reactions. Avoidance, as a form of self-protection, can reduce the possibility of adverse reactions caused by stressful events over the short term, whereas excessive fear of injury may lead to ineffective coping strategies [14]. The choice of coping strategies determines whether patients adopt a positive or negative attitude towards CR after surgery, and ultimately affects the outcome of future rehabilitation. The stress coping model proposed by Feifel et al.[15] shows that in addition to patients and disease characteristics, coping style also plays an important role in disease outcome. Individual personality and coping characteristics have been proven to be important determinants of postoperative emotional response and rehabilitation in patients with CABG [16]. Avoidance and vigilance coping styles affect postoperative medical status of patients with CABG, and are sometimes associated with their quality of life and anxiety [17]. Therefore, a negative coping style may increase the incidence of kinesiophobia in patients with AAAD.

It has been reported that social support can improve various negative emotions and mental states, and help patients with chronic diseases adapt their psychological and behavioral patterns [18]. Social support plays a considerable role in promoting physical activity in patients with coronary artery disease and is an important predictor of physical activity in these patients [19]. High levels of family support are associated with higher CR attendance and even longer survival; more family support predicts positive changes in mental health, while low levels of family support are associated with poorer perceived status and physical dysfunction [20,21]. Early studies have confirmed that integrating family into CR can help promote physical activity-related interactions [22] and reduce the occurrence of kinesiophobia.

Self-efficacy is closely and consistently related to physical activity. People with a high sense of self-efficacy are more likely to start and continue activities conducive to their recovery, whereas the contrary is true for those with low self-efficacy [23]. Studies have shown that during CR after discharge, self-efficacy is positively correlated with long-term adherence to physical activities [24]. A study[25] demonstrated that self-efficacy is an important risk factor for kinesophobia after total knee arthroplasty [OR = 1.4]. Zelle et al. [26] also concluded that self-efficacy is closely related to kinesiophobia and may be an important factor in the relationship between kinesiophobia and physical activity. Therefore, we believe that self-efficacy is one of the key factors affecting postoperative motility in patients with AAAD.

At present, there is a need for research regarding AAAD and risk factors for fear. Therefore, we conducted a cross-sectional study, to investigate AAAD and the fear of movement disorder patients and to explore possible induced factors, in order to strengthen the early identification of kinesiophobia in AAAD patients and provide a theoretical basis for the establishment of intervention programs

2. Materials And Methods

2.1 Patient populations

The continuous sampling method was used to collect patients who were first diagnosed type A aortic dissection in our hospital from January 2019 to December 2021 and underwent ascending aorta and hemiarch replacement combined with modified triple-branched stent graft implantation procedure successfully[27]. Inclusion criteria: Age ≥ 18 years; Patients in stable condition after discharge (3–10 months); Clear consciousness; Informed consent and voluntary participation in the study. Exclusion criteria: Language communication and body movement disorders; atients who could not receive rehabilitation treatment due to serious complications after surgery; Patients unwilling to continue to cooperate with the study protocol during the study.

This study was approved by the ethics committee of our hospital.

2.2 Data Collection

2.2.1 Social, demographic and clinical data retrieved from the hospital's database, including age, sex, and marital status; the rest of the data were collected by telephone, such as educational status, living conditions, pain onset, and family care index scale using various scales. Three unified training investigators conducted the study using remote follow-up telephone contact and one-on-one questionnaires. In the questionnaires, patients made choices independently, and researchers accurately recorded each answer. When patients were unable to fill in the questionnaires themselves due to educational level and other factors, investigators explained the items and filled in the questionnaires for the patients, as well as remedying problems such as missing filling of data in a timely manner.

2.2.2 Assessment of physical activity ability

Muscle strength assessment using a pedometer: This data was collected at the patient's follow-up visit 3 months after discharge. Patients were contacted by an investigator to participate in the study. The patients who agreed were scheduled for a follow-up visit at our hospital within the following few days. On the day of the follow-up visit, one investigator explained to the patients the purpose and use of the grip strength test and pedometer with unified instructions, and the other two investigators conducted the grip strength test and pedometer correction for the patients. Hand-grip test data were collected during the visit and patients were told to wear a pedometer for the following seven consecutive days, after which investigators collected the pedometer data.

2.3 Research Tools

2.3.1 General information questionnaire

Based on the purpose of the study, through literature research, and expert consultation, a general information questionnaire was prepared for the investigation, including items regarding demographic data, disease history, and hospitalization related medical information.

2.3.2 The Tampa Scale for Kinesiophobia Heart (TSK-SV-Heart)

The TSK-SV-Heart was adapted by Back et al. [12] from Sweden based on the Exercise fear Scale (TSK) for chronic pain patients, and its Cronbach's α coefficient was 0.78, demonstrating showing good reliability and validity. The scale contains 17 items and 4 dimensions, namely danger perception, exercise avoidance, exercise fear and functional disorder. Likert 4 scores were used, with 1 = completely disagree, 2 = disagree, 3 = agree and 4 = completely agree respectively. The total score was 17–68, and > 37 points could be diagnosed as kinesiophobia. The higher the score was, the more serious the patient's kinesiophobia.

2.3.3 Muscle strength assessment

Grip strength is a good indicator of an individual's overall muscle strength [28]. In this study, a uniform hand-held grip strength device (Olli 2.26, specification: 15*11*2.2cm) was used to measure grip strength twice in each hand, and the higher of the two values was used for data analysis.

2.3.4 Pedometer

Walking is one of the most basic, simple and popular physical activities [29]. In this study, a step-counting App was downloaded on the smartphone of each participant. The accuracy of the pedometer was verified in advance to reduce measurement errors. The average number of steps per day = the sum of steps per day /7.

2.3.5 Numerical Rating Scale (NRS)

When patients were admitted to hospital, they were instructed to use the numerical scoring method (NRS) to assess their pain [30]. The NRS scoring method divides a straight line into 10 segments, with 0 indicating no pain and 10 indicating severe pain. Patients choose a number to represent their degree of pain according to their own feelings, with 1–3 indicating mild pain, 4–6 indicating severe pain and 7–10 indicating severe pain.

2.3.6 Family care index scale (Adaptation, Partnership, Growth, Affection and Resolve, APGAR)

Designed by Smikestein [31], its Cronbach's α coefficient was measured to be 0.80–0.83, with good reliability and validity. The scale includes 5 dimensions, namely fitness, growth, cooperation, affection and affinity density, and the scoring method is Likert 3. "Almost rarely", "sometimes so" and "often so"

were represented by 0–2 respectively. The sum of the dimensions was the total score, which was 10 points. Higher scores indicated a greater degree of family care.

2.3.7 Medical Coping Modes Questionnaire (MCMQ)

The MCMQ, designed by Feifel et al. [15], is used to judge the characteristics of coping strategies selected by patients in the face of diseases. There were 20 items in the scale, and the total score was 60, including 3 dimensions, namely, facing, avoidance and yielding. The Likert 4 grading method was adopted. Among the 20 items, items 1, 4, 9, 10, 12, 13, 18 and 19 were scored backwards, and the remaining items were scored forward. The reliability of face, avoidance and yield were 0.69, 0.6 and 0.76, respectively.

2.3.8 General Self-efficacy Scale (GSES)

The GSES was compiled by Schwarzer et al. [32] and translated and revised by Wang Caikang et al. [33] The Chinese version of the General Self-efficacy Scale is used to measure the self-efficacy of subjects. Cronbach's α coefficient is 0.87. The scale is a single-dimensional scale consisting of 10 items. The Likert 4 grading method was adopted, with a score of 1 being "very inconsistent", 2 being "somewhat consistent", and 3 being "mostly consistent", and 4 score being "very consistent". The total score of the scale was calculated by adding the scores of all items and dividing by 10. Higher scores indicated higher levels of self-efficacy.

2.4 Data Processing

SPSS 26.0 statistical software (SPSS 26.0: SPSS; Chicago, IL, USA) was used for statistical analysis of the data. The counting data were described using frequency and percentage, and the measurement data were described by mean ± standard deviation. Spearman correlation was used to analyze the correlation between each scale and sports fear score. The chi-square test and independent sample t-test were used for univariate analysis. Multivariate analysis was conducted by binary logistic regression analysis, and $P < 0.05$ indicated statistically significant differences.

3. Results

3.1 General data analysis

Among the 312 patients after AAAD, 280 fulfilled the inclusion criteria (89.74%), 264 questionnaires were valid (84.62%) (Figure 1); the average age of patients was 53.33±11.85 years. The investigation showed that 122 patients had kinesiophobia, with an incidence of kinesiophobia after AAAD of 46.2%. Physical activity measurement 3 months after surgery revealed that the pedometer results of patients with kinesiophobia (4275.37±1067.11/ day) were significantly different from those of patients without kinesiophobia (5665.52±1660.42/ day) ($P < .001$), and the muscle strength assessment of patients with kinesiophobia were lower, indicating a significant difference between the two groups ($P < .05$) (Table 1). Other basic characteristics and surgical data are shown in Table 1 and 2. There was no significant differences in medical variables between the two groups ($P > .05$), indicating that the baseline risk levels and surgical data of patients in both groups were consistent (Table 1, 2).

Table 1

Table 1. Preoperative data analysis of patients with and without kinetophobia			
Variable	Kinesophobia (n=122)	Nonkinesophobia (n=142)	P value
Age(≥60y), n(%)	48(39.3)	32(22.5)	.003
Gender(Male), n(%)	95(77.9)	117(82.4)	.36
BMI(kg/m^2)(≥24), n(%)	69(56.6)	66(46.5)	.10
Marital status(Married), n(%)	112(93.3)	134(94.4)	.41
Education levels(Middle school or under), n(%)	99(81.1)	63(44.4)	<.001
Medical insurance Payment Method(Self-supporting), n(%)	12(9.8)	10(7.0)	.21
Residence (Rural), n(%)	71(58.2)	75(52.8)	.38
Current smoking, n(%)	19(15.6)	19(13.4)	.61
Current drinking, n(%)	29(23.8)	40(28.2)	.42
Pain, n(%)	107(87.7)	125(88.0)	.94
NRS score SD	7.76 3.13	7.98 3.18	.58
Steps/day (pedometer) SD	4275.37 1067.11	5665.52 1660.42	<.001
Grip strength test			
Left hand grip strength test(kg) SD	29.80 6.63	32.54 7.31	.002
Right hand grip strength test(kg) SD	31.84 8.56	35.46 8.56	.001
Diabetes mellitus, n(%)	6(4.9)	10(7.0)	.47
Hypertension, n(%)	84(68.9)	94(66.2)	.65
Hyperlipidemia, n(%)	17(13.9)	10(7.0)	.07
Marfan syndrome, n (%)	2(1.64)	5(3.52)	.34
Heart failure, n(%)	3(1.1)	2(1.4)	.53
Hemoglobin (g/L) SD	127.10 13.78	125.46 15.41	.37
EF(%) SD	61.87 6.13	61.99 7.49	.89
Continuous normally distributed variables were expressed as mean (standard deviation) and categorical data are given as the counts and percentage(n, %).			

Table 2

Table 2. Surgical data on patients with and without kinetophobia

Valuables	Kinesophobia (n=122)	Nonkinesophobia (n=142)	P value
ICU treatment days SD	3.6 1.34	3.88 1.64	.14
Intraoperative time			
Operative time (min) SD	304.5 56.8	308.2 51.9	.58
Cardiopulmonary bypass time (min) SD	148.4 31.6	146.5 37.1	.66
Aortic Clamp time (min) SD	55.1 16.7	54.3 15.9	.69
Low flow cerebral perfusion time (min) SD	16.7 4.3	16.4 5.9	.64
Concomitant arotic root procedure			
Bentall (%)	22(18.0)	29(20.4)	.62
Aortic valve replacement (%)	2(1.6)	3(2.1)	.86
coronary artery bypass surgery (%)	9(7.4)	11(7.7)	.91
David (%)	3(2.5)	4(2.8)	.83
Valsalva sinus forming (%)	25(20.5)	28(19.7)	.88

Continuous normally distributed variables were expressed as mean (standard deviation) and categorical data are given as the counts and percentage(n, %).

3.2 Family care index, medical coping style and general self-efficacy score

The total family care index score was (7.2±1.43), indicating good family function. The scores of medical coping styles were as follows: facing (20.92±3.36) > avoidance (17.76±3.01) > yielding (10.60±2.30), and the total score of postoperative general self-efficacy was (23.23±3.85), presenting a moderate level. There were significant differences between the two groups regarding family care, medical coping style and self-efficacy (P < .001) (Table 3).

Table 3

3.3 Univariate analysis of postoperative kinesiophobia in patients with AAAD

In univariate analysis, patients ≥60 years old, BMI ≥24, and education level at junior, middle school, or below were more likely to suffer from kinesiophobia (P < .01)(Table 1).

Table3. The scores of family care index, medical coping style and general self-efficacy scale and their correlation with kinetophobia

Variable	Score	R value	P value
MCMQ			
Facing	20.92 3.36	-0.43	<.001
Avoidance	17.76 3.01	0.51	<.001
Yielding	10.60 2.30	0.50	<.001
APGAR	7.2 1.43	-0.42	<.001
GSES	23.23 3.85	-0.25	<.001
Continuous normally distributed variables were expressed as mean (standard deviation).			

3.4 Results of multiple logistic regression analysis

Considering the existence of fear of motility as a dependent variable, the related variables conforming to P < 0.1 in the univariate analysis results were included in the multivariate logistic regression analysis (Table 4), and 8 variables finally met the inclusion criteria: general demographic data: Age (≥60 years old), high blood lipids (yes), education level (middle school or under), scores of family care index, scores of various dimensions of medical coping style, total scores of general self-efficacy. Continuous variables are input with original values, and classified variables are assigned with values. Multivariate logistic regression analysis showed education level (OR=11.339, 95%CI: 3.618–35.544), general self-efficacy (OR=0.727, 95%CI :0.605–0.874), family care index (OR=0.264, 95%CI :0.152–0.4) 59), medical approach style (OR=0.664,95%CI: 0.5542–0.814), avoidance style (OR=1.733, 95%CI: 1.395–2.153) and submission style (OR=2.039, 95%CI: 1.561–2.664) were the influencing factors for the occurrence of phobia.

Table 4

Table 4. Multivariate Logistic regression analysis of kinetophobia in AAAD patients

Independent variables	B	S.E.	Wald	P	Exp(B)	Lower 95%Cl for Exp(B)	Upper 95%Cl for Exp(B)
Age(≥60y)	0.35	0.58	0.37	.54	1.43	0.46	4.44
Hyperlipidemia	0.62	0.82	0.58	.45	1.87	0.38	9.23
Education levels (Middle school or under)	2.43	0.58	17.35	<.001	11.34	3.62	35.54
APGAR	-1.33	0.28	22.36	<.001	0.26	0.15	0.46
MCMQ							
Facing	-0.41	0.10	15.49	<.001	0.66	0.54	0.81
Avoidance	0.55	0.11	24.65	<.001	1.73	1.40	2.15
Yielding	0.71	0.14	27.33	<.001	2.04	1.56	2.66
GSES	-0.32	0.09	11.55	.001	0.73	0.61	0.87

Age: < 60=1, ≥60=2; High blood lipid: yes =1, no =0; Education: Junior high school or below =1, senior high school or above =2; Family care index, medical coping style questionnaire and general self-efficacy were input with original values.

4. Discussion

The cross-sectional results of this study found that 46.2% of patients who survived AAAD exhibited varying degrees of motility 3–10 months after successful surgery, with high levels of motility. Patients with lower education levels, negative coping styles, lower family care indices and generally lower self-efficacy were associated with postoperative kinesiophobia.

In our study, 46.2% of patients with AAAD suffered from kinesiophobia, which was lower than that of the study of Dą Bek J et al. [34] study on the incidence of postoperative kinesiophobiain 217 patients with coronary artery disease (> 70%) and higher than the results of Back et al. [12] on the incidence of kinesiophobia in 332 patients with coronary heart disease (20%). The disparate results may be explained by the different nature of the disease. In the present study, 87.9% of the patients had severe pain at the time of disease onset, which easily resulted in traumatic fear memories. Many patients were unable to cope with their fear, leading to long-term avoidance of physical activities and exercise. According to relevant literature, even if surgical intervention is performed at an early stage, the mortality rate of recurrence and the incidence of surgical complications are high [35]. Some patients avoid physical

activity and exercise for fear of disease recurrence caused by activities. The specific psychological process of fear of exercise in patients with AAAD can be explored by qualitative studies in the future.

Patients with fear of movement disorder exhibited lower postoperative muscle strength and physical activity compared with patients without fear of moving ($P < 0.01$) in a previous study of neck trauma muscle activation which also found that the muscle performance negatively correlated with fear of moving [36]. However, the applicability of this result to patients with AAAD movement disorder still requires further research. We found that participants with less education were more likely to have kinesiophobia than those with higher education. Some studies have confirmed [37] that the education level of patients can affect the level of postoperative motility, but it is not clear in the study of AAAD motility. It is unknown if patients with lower levels of education did not fully grasp the postoperative rehabilitation concept, and if knowledge about the disease is low, making these patients more prone to irrational cognition, where by experiencing some symptoms experienced during physical activity feel similar to those experienced during the onset of aortic dissection disease. Some patients after an appropriate increase of the heart rate, shortness of breath and other normal physiological symptoms may associate these as symptoms of disease onset, and engage in avoidance behavior [8]. Therefore, medical staff can explain the significance of postoperative rehabilitation and the value of functional exercise to the patients through education based on the different knowledge and acceptance of patients, to reduce the incidence of dyskinesia caused by low cognition.

Our study showed that postoperative general self-efficacy was negatively correlated with kinesiophobia in patients with AAAD (Table 3). The results of multivariate logistic regression analysis showed that general self-efficacy was an influential factor for the occurrence of kinesiophobia in patients with AAAD after surgery (Table 4), that is, higher self-efficacy was associated with lower kinesiophobia. Tabernero [38] found that a large part of the impact of exercise fear on physical activity was explained by a lower sense of self-efficacy. Positive and healthy self-efficacy beliefs can make patients more confident in regulating their emotions and induce higher compliance to brain exercise. In this study, 81.1% of the participants had a junior high school education level or below, and had low ability to accept, understand, and actively acquire disease knowledge. The more serious they were about the adverse consequences of disease, the lower their levels of self-efficacy. Second, self-efficacy can affect physical activity behaviors through the development and use of self-regulating behaviors. Patients with low self-efficacy have more difficulty in facing painful traumatic memories and are more likely to adopt negative coping strategies to face the pressure caused by actiphobia, leading to further fear of physical activity. In view of this, it is necessary for healthcare providers to consider self-efficacy as a major contributor to kinesiophobia and establish self-efficacy enhancement strategies to increase the chances of physical activity in patients with AAAD after surgery.

We also found that a negative coping style is a significant risk factor for dyskinesia. This result is consistent with that of Helminen [39], who found that negative coping was associated with kinesiophobia and increased rates of long-term disability and depression. Somers et al. [40] also concluded that individuals who experience pain-related fear are likely to engage in avoidance behaviors, especially

avoidance of sports and physical activities. Although these patients had successful surgery and improved post-operative functioning, they still had difficulty erasing traumatic memories, leading to anxiety and other mood changes that were difficult to overcome. Further, patients were concerned about the risk of elevated blood pressure caused by exercise during CR due to their uncertainty about their future health status and the safe level of exercise after surgery. More negative coping strategies may therefore be used to cope with the stress caused by actiphobia, leading to higher pain intensity and further fear of physical activity.

In addition to the risk factors mentioned above, we also found that less family support was associated with an increased incidence of kinesiophobia, and there was a significant negative correlation between APGAR and kinesiophobia scores. Multifactor analysis suggested that APGAR was a protective factor for kinesiophobia in patients with AAAD after surgery. Birtwistle et al. [22] also confirmed that family support is closely related to physical activity (PA) behavior. Family members can convey CR information to patients and encourage them to adopt positive behaviors, and provide chaperon-based forms of PA to promote patients' PA participation [22]. Therefore, there is strong evidence that family support is a key factor in PA and can reduce the incidence of kinesiophobia. However, there are also some challenges in the family, including the family becoming "over-involved" and the family's own health beliefs, which could negatively impact patients, and the role of family caregivers in patients with AAAD requires further study.

5. Limitations

The following limitations were also considered in this study. First, this was a single-center study with a limited sample size, which may affect the statistical results. In the future, multi-center studies are needed to further analyze the status of exercise fear in patients with AAAD. Second, recall bias may occur in remote telephone collection of questionnaire information, resulting in data errors. More rigorous data collection methods should be developed for subsequent studies. Third, our study only examined some factors that may affect kinesiophobia, but did not take into account the influence of preoperative factors, particularly preoperative anxiety and sleep state, which have been proven to be related to kinesiophobia in other studies. Further studies in this aspect should be conducted.

6. Conclusion

Patients with AAAD exhibit a high incidence of postoperative kinesiophobia. Patients' education level, medical coping style, family care index and general self-efficacy are related to the occurrence of postoperative kinesiophobia. Therefore, the existence of kinesiophobia should be considered in the CR of patients with AAAD.

Abbreviations

Acute type A aortic dissection (AAAD)

Acute Aortic dissection (IRAD)

Cardiac rehabilitation (CR)

The Tampa Scale for Kinesiophobia Heart (TSK-SV-Heart)

Physical activity (PA)

Numerical Rating Scale (NRS)

General Self-efficacy Scale (GSES)

Medical Coping Modes Questionnaire (MCMQ)

Family care index scale (Adaptation, Partnership, Growth, Affection and Resolve, APGAR)

Declarations

Ethics approval and consent to participate

This study was approved by the Ethics Committee of Union Hospital, Fujian Medical University (2021KY089) and conducted in accordance with the Declaration of Helsinki.We also received written informed consent from subjects or their legal counsels before research commencement.

Consent for publication:

Not applicable

Availability of Data and Materials:

The data that support the findings of this study are available from Fujian Cardiac Medical Center but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of Fujian Cardiac Medical Center.

Competing interests

All authors declare that they have no competing interests.

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Authors' contributions

Yanjuan Lin and Liangwan Chen designed the study and submitted the manuscript. Yanjuan Lin and Yaqiong Chen prepared the first draft of the manuscript and made the literature review. Yaqiong Chen and Yanjuan Lin are contributed equally to this study and share first authorship. Yanchun Peng made substantial changes in the manuscript together. Xizhen Huang collected and analyzed data together. All authors read and approved the final manuscript.

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Figures

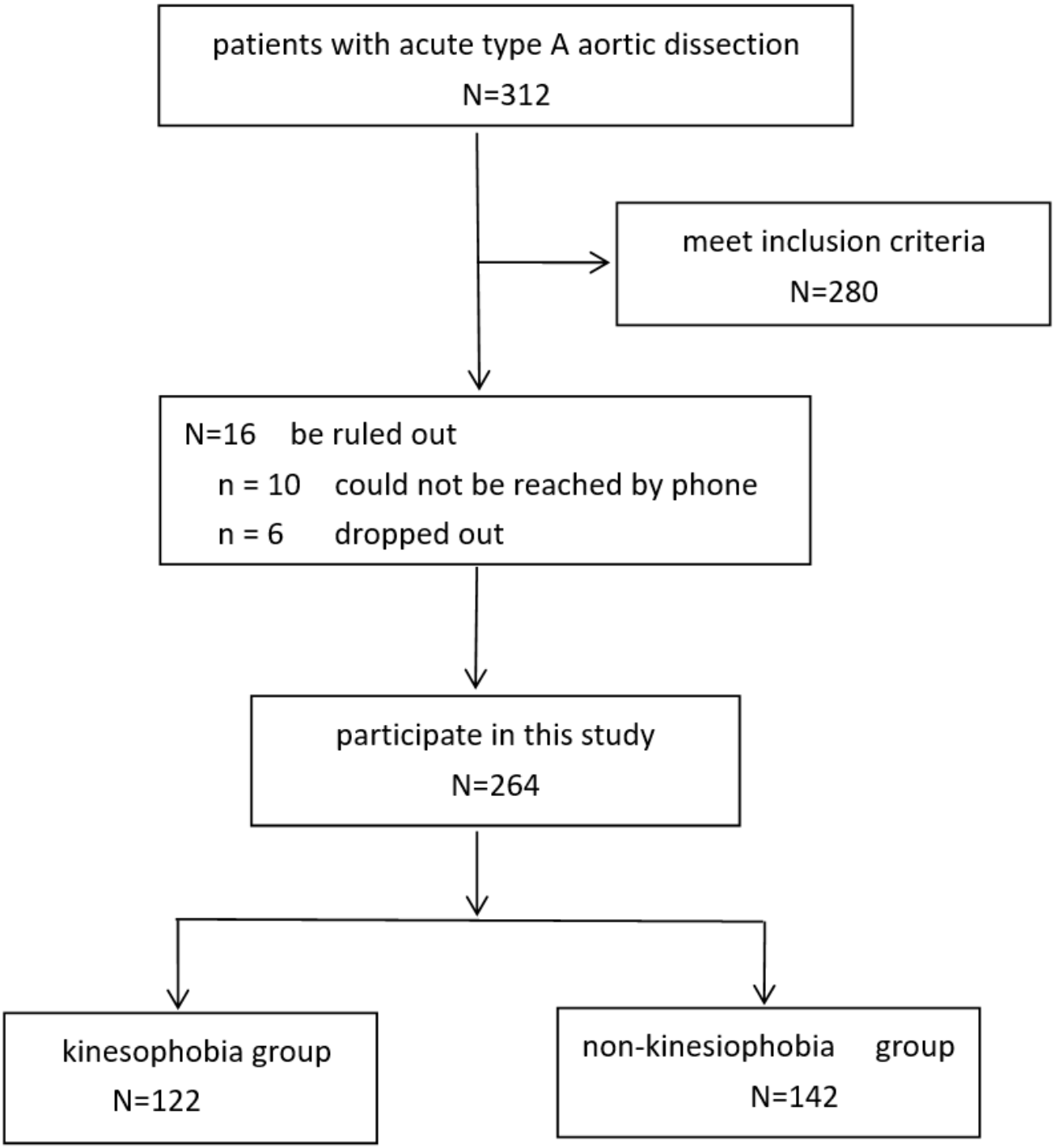

Figure 1

Date collection procedure